Di-estyryl derivatives of the ethyl ether (C₈H₇O)₃C(OAc)₂. [165°]. From the ether (1 mol.) and Ac₂O (2 mol.) at 100° (P.). Long needles. Partially decomposed by fusion and by solution in water.

Di-acetyl derivatives C(OAc)₂C(OH)₂ [130°]. From (C₈H₇O)₃C(OAc), and dilute alcoholic KOH. Needles. Its alkaline salts are v. sol. water; its silver salt Ag₂C₈H₇O₂ is an insoluble powder.

* Amide C(OH)(CONH)₂. Deliquescent tar which turns red in the air.


Phenyl-hydrazide of the Nitrile PhH₂N₂C-CN [158°]. May be formed from the oxime-hydrazide of glyoxylyl-cyanide H.O:N:G:C(N₂H),CN by dissolving in FOC₈, heating with FCI₄, pouring into ice, and treating the crystals with ether and alkali (Von Pechmann a. Wehrran, B. 21, 8001). Yellow needles (from ether-ligroin). Turns brown at 125°. Sol. in water, alcohol, and the usual menstruums. Cone. H₂SO₄ forms a blood-red solution not changed by FeCl₃. On warming with conc. HClAg it forms yellow needles of C₅H₈,N,O [245°].

* MESOXALIC ALDEHYDE CHO.CO.CHO. MESOXALON: CO.CHO.CNOH or ON.CH₂.CO.CH₂.NO. v. DI-ETHYLACETONE.

Mesoxalic semi-aldehyde =CHO.CO.CO.H. Glyoxylyl carboxylic acid.


* Nitrite CHO.CO.CN v. Glyoxylyl cyanide.

Mesoxalic bromo-semi-aldehyde =CBrO.CO.COH.


* MESOXALYL-UREA is ALLORAM. See also its compounds with Methyl-aniline, Naphthylamine, and Pyrrole.

* METAL. Use of this prefix applied to incorporate compounds for Metal-oxides and Metal-salts v. the acids or salts to the name of which Metal is prefixed. Thus Metal-phosphoric acid will be found under Phosphoric Acids, and Metal-stannates under stannates, a subdivision of the article Tin.
METALLIC ACIDS.

The compounds H\textsubscript{2}AlO\textsubscript{3} and H\textsubscript{2}ZnO\textsubscript{3} are also bracketed, because the reactions of these bodies show that they may be classed as feeble acids and at the same time as basic hydroxides.

An examination of the composition of the metallic acids shows that the reacting atomic aggregates of these compounds contain a number of atoms of a negative element, or group of elements, which is large relatively to the number of atoms of metal present. The accumulation of negative atoms so modifies the functions of the H atoms that these are replaceable by metals, and this notwithstanding the presence of the positive metallic atoms. The H of the metallic hydrogen-containing compounds H\textsubscript{2}CrO\textsubscript{4} (= CrO\textsubscript{3}H\textsubscript{2}O) and H\textsubscript{2}CrO\textsubscript{3} (= CrOH\textsubscript{2}O) is not replaced by metals when these compounds react with metallic hydroxides or carbonates; but when 4 atoms of the negative O are associated with one atom of Cr and 2 atoms of H, the H of this compound (H\textsubscript{2}CrO\textsubscript{3}) is distinctly acidic.

The negative character, or acid-forming character, of the groups CN and SCN is rendered evident by the number of acids which are formed by the union of these groups and metals. Many of these compounds occur in sufficient quantity to be of direct importance to the metallurgist, except in so far as they may tend to introduce impurities into the metal to be extracted.

Chemically, ores may be broadly divided into three classes, containing respectively -- I. Native Metals, i.e. metals uncombined with any non-metallic element. II. Sulphides and arsenides. III. Oxides, including carbonates and silicates.

Class I. Native Metals. A native metal may be separated from its ores in one of four ways: (a) By Liquidation. In order that this may be done it is essential that the metal be fusible at a temperature insufficient to cause the earthy portions of the ore to frit or agglomerate; e.g. Bi. (b) By fusing the ore, when the metal will sink to the bottom by reason of its high S.G.; e.g. Bi, Cu. (c) By dissolving the metal out by means of another metal; e.g. Au, Ag, Pb. These metals are dissolved out of their ores by Pb, which is then removed by cupellation, or, in the case of Ag, the separation of the Ag from the Pb may be effected by Zn, which does not alloy with Pb, and being specifically lighter rises to the surface, carrying the Ag and some lead with it. The Zn is subsequently distilled off, and the residual Ag and Pb cupelled. Similarly, Au and Ag may be dissolved out by Hg, which may then be distilled off. (d) By dissolving the metal by means of an acid or a gas in solution; e.g. Au extracted by a solution of Cl\textsubscript{2} and Pt, Pb, Sr, Rh, and Ru by aqua regia. The Au and Pt may be refined by wet processes, taking advantage of the fact that Au and Pt are insoluble in sulphuric, hydrochloric, and nitric acid, when these acids are used separately, but are soluble in aqua regia, while the Ag, Cu, Pb, and Fe are freely soluble in one or other of these acids.

In 'parting' Au, sufficient Ag must be present to allow the acid free access to the impurities, which would otherwise be protected by the insoluble gold. Pt, when present in Ag in only small quantity, may be separated by 'parting' with Ag, as under these conditions the Pt is
acted on by the "parting acid." If present in larger quantity, it must be ppt. from a solution. In fusing the ore, the parting acid is removed by difference of S.G., and from Pt it may be removed to a certain extent by using aqua regia of medium concentration, in which it is not freely soluble. Pt is ppt. from its solutions as a double salt of Pt and NH₄ by adding NH₄Cl. Pd, if present, may be ppt. before the Pt by neutralising with Na₂CO₃ and adding H₂C₂O₄ or Ir, if it has gone into solution, will not be ppt. with the Pt, but its double salt is difficult to wash out. Pd, Rh, Ru, and Os will also be found with the Ir in solution after the Pt has been ppt. Ra may be removed completely by fusing the platinum double chloride with K₂H₂O, and a small quantity of NH₄H₂O. Ir may be ppt. at the same time as platinum by KCl, and the ppt. fused with K₂CO₃, which will oxidise the Ir and not the Pt. Remove the potassium salt by boiling water, and then dissolve out the platinum with aqua regia, in which the oxide of Ir is insoluble. Ir may also be separated from the ppt. by KCN, the Ir salt being readily soluble, while the platinum salt is insoluble. Pt is obtained in the metallic state by carefully heating the double chloride, which then breaks up. Au is ppt. from its solutions as metal by FeSO₄, Ag, H₂O₂, or H₂O₃. For dental purposes, Au is frequently deposited by electrical means. Ag is first thrown down as chloride, which is afterwards reduced by Cu, Zn, or Fe. Reagents, containing not more than 10 p.p.m. Ag, is also refined by Miller's process, at the Australian Mint, in the dry way, by passing CI into the molten gold. The impurities As, Sb, Bi, Pb, and Zn are converted into chlorides, which volatilise, and the Ag becomes AgCl, which forms a fused layer on the surface of the gold.

Class II. Sulphides and Arsenides. Dry methods. Sulphides and arsenides are either (a) fusible, at such temperatures as can be obtained in furnaces on the large scale; (b) fusible; or (c) volatile without fusion.

(a) In fusible sulphides. In these cases the S must be replaced by O, as an infusible sulphide cannot be properly reduced to the metallic state. This is done by calcining or roasting the ore, so that air has free access to it. The sulphide is oxidised to a sulphate at low temperatures, and at higher temperatures the sulphate breaks up into SO₃ and an oxide of the metal. Practically there is only one sulphide under this head, viz. ZnS, zinc blende. For the subsequent treatment of the oxide v. "oxide clays."

(b) Fusible sulphides. Sulphides and arsenides of this class may be subdivided as follows:—(i) those which are fusible at a very low temperature, insufficient to produce frothing, i.e. incipient fusion causing agglomeration of the constituents of the ore; (ii) those requiring a higher temperature, at which frothing would take place. A sulphide in division (i) may be fused out, e.g. Sb₂S₃. The sulphides and arsenides belonging to (ii) may be separated by fusing the ore, when the sulphide or arsenide would collect together beneath the slag; e.g. sulphide of copper (copper pyrites); arsenides of nickel and cobalt (if sufficient arsenic is not present in the ore more is added), the arsenide separates in a distinct layer from the sulphides of other metals during the fusion; sulphide of nickel obtained by fusing nickel ores, or products, free from arsenic, with iron pyrites. The sulphides and arsenides separated from the gangue would next be treated in one of the following ways:—1. Converted into oxide by roasting; e.g. Sb₂S₃, copper matte, arsenides of nickel and cobalt (the arsenious acid being condensed in coke towers), sulphides of nickel and cobalt free from arsenic; the oxides of nickel and cobalt are subsequently treated in the wet way. 2. Partially roasted to form a certain amount of oxide and sulphate, and then fused; the oxygen of the oxides combines with the sulphur of the sulphides and arsenides, forming SO₃ and liberating the metal; e.g. Sb₂S₃ and PbS. In the case of the double sulphide of Cu and Fe, the Fe is first removed by a series of calcinations and fusions, S passing to the Cu and O to the Fe, the oxide of iron thus formed uniting at the same time with silica to form slag. This process goes on so long as any iron remains. As soon as the iron is all removed, the reaction between Cu₂S, CuO, and Cu₂O takes place, liberating sulphur, and the principal impurities in copper ores likely to pass into the Cu are As, Sb, Zn, Pb, Bi, Sn, Ni, Co, Au, and Ag. The greater proportion of these present either volatilises or becomes oxidised and removed in the slags. As and Ag being neither appreciably volatile under the conditions nor oxidisable, become concentrated in the copper. It is particularly difficult to get rid of the last traces of As and Bi. The use of a basic lining to the furnace—say, dolomite—greatly facilitates the removal of As in the slag. The elimination of As is also assisted by the use of "soda nitre" in refining. Bi can most readily be removed by what is known as the best-selecting process, in which advantage is taken of the circumstance that copper has a greater affinity than bismuth for sulphur. This process comes in just before the copper is first reduced from the sulphide. A little copper is made to separate by the reaction between sulphide and oxide; this blows out and collects as "bottoms" the bismuth, tin, lead, and antimony. 3. Fused in the presence of another metal which combines with, and so removes, the sulphur; e.g. sulphides of Bi, Pb, and Sn treated with Fe; Ag separated by metallic Pb from sulphide of Pb containing sulphide of Ag. Copper can only be partially separated from sulphur in this way, a double sulphide forming which cannot be reduced by iron.

The operations described under (i) and (ii) are in some cases applied directly to the ore without first separating the sulphide by fusion or fractionation. (c) Sulphides volatile without fusion. Amongst the metallic sulphides there is only one which sublimes without fusion, viz. HgS. When heated in presence of air HgS yields SO₂ and Hg. As the Hg has no tendency to combine with oxygen under these conditions, and is volatile at a very low temperature, it distills over, and may readily be condensed. For these reasons advantage is not taken of the fact that the sulphide is itself volatile, it being simpler to distil the metallic mercury direct from the ore. The sulphur is sometimes removed by roasting the mercury ore with lime or oxide of iron.
Treatment of Sulphides by Dry Methods.

I. Inertible.
   Calcined = oxide
   II. Fusible.
      (a) Low temperature
      (b) High temperature
      Liquidated
      Fused and separated
      as sulphide

Roasted Partially roasted Sulphur removed by sulphur re-
= oxide = metal means of another metal = metal
= metal

III. Sublimed without fusion.
1. Sulphur separated by calcination alone = metal.
2. Sulphur separated by lime, oxide of iron, or iron = metal.

Wet processes for sulphides and arsenides. The sulphides and arsenides of Ni, Cu, and Co are partially, and those of Cu and Ag partially or wholly, treated by wet methods. In these processes the metal is first made to form a soluble compound. This may be done by roasting the ore with, or in some cases only mixing it with, some compound, which by double decomposition will convert the metal to be extracted into a soluble compound. In other cases it is done by roasting the ore alone at a low temperature, or even by simply exposing it to the action of the atmosphere without using artificially produced heat; in either case the sulphide will be converted into a sulphate; e.g., copper pyrites and silver ores.

Thus, soluble sulphate of copper may be formed by roasting copper pyrites or more slowly at the ordinary temperature of the atmosphere. About one-third of the copper extracted in this country is obtained from Spanish pyrites, averaging only 2-4 p.c. of copper, by roasting the burnt ore—received from the sulphuric acid works—with common salt, which reacts with the CuSO₄ produced during the burning, to form CuCl₂, which is then dissolved out, together with the chlorides of Ag, Pb, and Au, these metals being present to a small extent. The Ag is thrown down, along with Au and Pb, by a soluble iodide, KI or Zen. The iodine is removed from the AgI by Zn. Finally the Cu is paid by addition of iron.

The reactions which take place in the wet treatment of silver ores are of special interest and importance. They are divisible into three classes.

I. The insoluble silver compound is decomposed and the Ag amalgamated while still in the ore (‘free milling ore’), without the aid of any furnace operation whatsoever. If there is much S or As present the ore, practicable, is first roasted with salt. Under this head are included all the amalgamation-processes.

II. The insoluble silver compound is converted into sulphate by roasting alone and washed out with water; or the Ag is converted into chloride by roasting with common salt, and washed out by a solvent for chlorides of silver. Under this head are included the Augustin, Ziervogel, Von Paters, and Russell processes.

III. The insoluble silver compound is converted into a soluble compound by the action of certain salts in solution without roasting the ore or employing any furnace-operation whatsoever. This class includes the Von Paters process when applied to amalgamation tailings, and the Russell process applied to both ores and tailings. The amalgamation methods without roasting have been of great service where fuel is scarce, as in Mexico. These methods depend on the power of certain salts, such as the chlorides of Cu, to decompose Ag₂S. If mercury is present at the same time, the AgCl will be reduced and the Ag taken up by the excess of Hg, from which it can be separated by squeezing and distillation. Iron or Cu may be employed to decompose the AgCl, Hg being used only to collect the Ag. This reduces the loss of Hg, but to bring about sufficient contact, more power, and consequently more fuel, is required. Where fuel is available there is often great advantage in roasting the ore with salt before amalgamation.

Where possible the amalgamation methods have been superseded by the other wet processes included under heads II. and III., viz. the Augustin, Ziervogel, Von Paters, and Russell methods.

The Augustin process. Ore or regulus is first partially roasted, and then undergoes further roasting with common salt; the AgCl thus formed being washed out with NaClAg and paid for by Cu. The Ag is usually first concentrated in copper mattes.

The Ziervogel process. This method depends on the difference between the temperatures required to break up the sulphates of different metals. Thus by suitably regulating the temperature, the sulphates of Fe, Cu, &c., formed by roasting mattes at a low temperature, may be decomposed into oxides and SO₃, while the sulphate of Ag will be unaltered, and can therefore be extracted by warm water, and then paid, as in the previous method. The regulation of the temperature throughout a large furnace is obviously a point requiring considerable skill. For this reason, in practice, mattes are usually first worked by the Ziervogel process, and the residue extracted by the Augustin method.

Von Paters process. The soluble salts produced by roasting the matte are first dissolved out with water, after which the matte is further roasted with NaCl, and the AgCl washed out with Na₂SO₄Ag or CaSO₄Ag, from which solution the Ag is paid for by a soluble sulphide or S. The silver is reduced from the Ag₂S, either by roasting or by boiling with freshly slaked lime, forming calcium polysulphide. When there is much of the base metals present, more particularly lead, the Von Paters process is not so suitable. The lead is mostly present as sulphate after roasting, and this is soluble in Na₂SO₄Ag. Some of the most important objections to the Von Paters process, as applied to pregnant ores containing base metal, are obviated in the process next described.
The Russell process. In this process what is known as the 'extra solution' is used, in addition to or in substitution for that ordinarily employed in the Von Patera process. The 'extra solution' is prepared by making solutions of $\text{Na}_2\text{SiO}_3$ and $\text{CuSO}_4$ containing respectively 18 parts of the former and 10 parts of the latter salt, and mixing them together. The pp. after washing is dissolved in a solution containing 1-2½ p.c. $\text{Na}_2\text{SiO}_3$. Although this 'extra solution' is not a good solvent for $\text{AgCl}$ as $\text{Na}_2\text{SiO}_3\text{AgCl}$, yet it acts energetically on native silver and the compounds of silver with $\text{S}$, $\text{As}$, and $\text{Sb}$. Owing to the want of permanence special precautions have to be taken in using this solution. To get the best effect the solutions should be used warm. In order to obtain fine bullion by this process, advantage is taken of the fact that $\text{PbCO}_3$ is not soluble in the solution, although other salts of lead are soluble. $\text{Na}_2\text{CO}_3$ free from $\text{NaOH}$ and $\text{Na}_2\text{S}$, is added to the solution containing the silver and lead which have been washed out. It is stated that the whole of the $\text{Pb}$ may thus be removed. Carboante and sulphate of $\text{Cu}$ are the only compounds of $\text{Cu}$ likely to occur which are soluble in the 'extra solution'.

It is probable that this process in the near future will supersede very largely the fusion and amalgamation processes, besides which it is applicable to ores which cannot profitably be treated by either of the other methods. The cost of the necessary chemicals is much less than that due to loss of mercury; in addition to which, lead and copper are lost in the older processes and saved in the Russell process.

In some cases the ores may be treated directly by the Russell process without previous roasting, and both the Von Patera and Russell methods are largely used in the treatment of 'tailings' from amalgamation.

Nickel and cobalt. It has been seen that these metals may be separated from others as arsenide. In practice however, the separation is not so complete, some of the nickel and cobalt passing into the regulus, and some of the other metals into the speise. The following are the reactions usually employed to separate the various metals from each other. The calcium speise is treated with $\text{HCl}$ and $\text{AgNO}_3$. The resulting solution, which will contain $\text{Ni}$, $\text{Co}$, $\text{Fe}$, $\text{Cu}$, $\text{Pb}$, $\text{Bi}$, and $\text{As}$, is diluted, and oxidised by bleaching-powder, the proportion added being adjusted by a rough analysis. Milk of lime is added to the requisite extent to throw the iron down as ferric oxide, any arsenic present at the same time as basic arsenate of iron. The solution is next treated with $\text{NH}_4$ to ppt. $\text{Cu}$, $\text{Pb}$, and $\text{Bi}$, after which the $\text{Co}$ can be thrown down as cobaltic oxide by a further addition of bleaching-powder, and subsequently the $\text{Ni}$ pptd. as hydrated oxide by the addition of milk of lime.

Class III. Oxides; including carbonates and silicates. Ores of this class are reduced to the metallic state by means of carbonaceous matter such as charcoal, coal, or coke, or by means of the gaseous product of the incomplete oxidation of carbonaceous matter, viz. carbon monoxide.

Only the oxides of the commoner metals are $\text{Al}_2\text{O}_3$ and $\text{MgO}$. These oxides cannot be reduced to the metallic state in this way; they have to be converted into double chlorides, from which, while in a state of fusion, the metals are liberated by metallic sodium, or by electrolysis. The metals, the oxides of which are in practice reduced by carbon or $\text{CO}$, are $\text{Sn}$, $\text{Fe}$, $\text{Ni}$, $\text{Co}$, $\text{Mn}$, $\text{Cr}$, $\text{W}$, and $\text{Zn}$. Of these $\text{Sn}$ and $\text{Zn}$ present the simplest reactions. The reactions in the other cases are complicated by the fact that all these metals combine more or less freely with carbon. When it is desired to obtain the metals in the most malleable condition, i.e. free from carbon, the fact that the oxides and the carbureted metals react with one another eliminating both the carbon and the oxygen, as $\text{CO}$ and $\text{CO}_2$, is utilized. Every iron- and steel-making process is dependent on this reaction. According as the conditions are made more or less favourable to carbureisation, or decarbureisation, so will the resultant metal be either cast-iron, hard steel, mild steel, or malleable iron. It is possible to reduce the oxides under consideration to the metallic state, and also to carburete the metals, by the action of $\text{CO}$, without the metals becoming fused. The oxides are first reduced, and then carbureted by the dissociation of some of the $\text{CO}$. The liberated oxygen combines with $\text{CO}$ and is thus removed. Nickel is thus reduced to the metallic state, more or less combined with carbon; and bars of metallic iron are carbureted to produce 'sematization' steel. In a similar way a carbureted metal may be decarbureted by $\text{O}$ or $\text{CO}_2$; in this way 'malleable cast-iron' is made. Whether the action consists of carbureising or decarbureising is entirely dependent on which agent preponderates at the time in the atmosphere surrounding the body.

Reactions for removal of 'impurities' from metals of oxide class. The refining of $\text{Ni}$ and $\text{Co}$ as we have seen, precedes the reduction to the metallic state. The refining of $\text{Sn}$ is effected after reduction, partly by liquation and partly by oxidation, by which means the principal impurities, $\text{Fe}$, $\text{As}$, and $\text{W}$, are removed. $\text{Mn}$ and $\text{Cr}$ are reduced directly from their ores, in the form of alloys with iron, only pure ores being used. Tungsten is either reduced directly from the ore, alloyed with iron, or undergoes a preliminary purification by oxidation. The calcium speise is treated with $\text{HCl}$ and $\text{AgNO}_3$. The resulting solution, which will contain $\text{Ni}$, $\text{Co}$, $\text{Fe}$, $\text{Cu}$, $\text{Pb}$, $\text{Bi}$, and $\text{As}$, is diluted, and oxidised by bleaching-powder, the proportion added being adjusted by a rough analysis. Milk of lime is added to the requisite extent to throw the iron down as ferric oxide, any arsenic present at the same time as basic arsenate of iron. The solution is next treated with $\text{NH}_4$ to ppt. $\text{Cu}$, $\text{Pb}$, and $\text{Bi}$, after which the $\text{Co}$ can be thrown down as cobaltic oxide by a further addition of bleaching-powder, and subsequently the $\text{Ni}$ pptd. as hydrated oxide by the addition of milk of lime.
METALLURGICAL CHEMISTRY.

chemically only in the blast-furnace, because when treating pig-iron for the production of malleable iron the sulphur is one of the last substances to oxidize out, and its removal would result in a great waste of iron. To remove S in the blast-furnace the temperature must be high, and the conditions must be strongly reducing and carburising: i.e., the charge must contain plenty of charcoal, coal, or coke, and lime must be added to the charge in considerable quantity. Under these conditions the S will combine with the Ca, and passes into the slag as sulphide.

Slag reactions. Slags consist of the non-metallic constituents of an ore or furnace-product, and of the useless or objectionable metallic elements. They are produced by simply fusing the ore alone, if it is in itself sufficiently fusible, or by fusing it with such materials—fluxes—as will bring about the requisite fusibility. Except in a few special cases, e.g., the reduction of aluminium or magnesium, slags consist of more or less complex silicates. In processes for making more or less malleable iron, the slags are composed mainly of silicates of Fe, Ca, Al, and Mg, with small proportions of oxides of Mn, alkalis, and alkaline earths. In pig-iron slags, the iron is comparatively small in quantity, or is even entirely absent when much lime is used. In other slags, excepting those produced in treating the ‘noble metals,’ iron will generally be present in large proportion.

Electro-Metallurgy. Electro-metallurgical processes are divisible into two distinct classes: one class includes processes for the extraction of metals from their ores; the other includes processes for refining metals already extracted. Although a great many processes have been devised for the electrical extraction of metals, except for the extraction of aluminium and magnesium—in which cases the metals are first got into the condition of double chlorides, or, in the case of aluminium, sometimes of fluoroide—there is not much prospect of such processes being successfully and economically worked, even when operated from water-power alone.

By the Cowles process, according to Sterry Hunt, nearly pure Al is produced in small buttons, but up to the present it has been necessary to reduce some other metal with the Al to collect it together. In this process the Al and the oxide of the metal to be alloyed with the Al are mixed with carbon, and the mixture is placed round two carbon poles between which an electric discharge is made to pass.

The second class of processes has been advantageously applied to the refining of Cu, more particularly Cu containing small quantities of Au and Ag. In refining Cu electrically, the electrolyte is usually CuSO₄ Ag₂O, kept at a uniform temperature and concentration as possible; the anode being formed of the copper to be refined, pure copper depositing on the cathode. The silver and gold collect at the bottom of the tank as a muddy deposit.

MÉTALLAGE. An element is a definite and distinct kind of matter which has resisted all attempts to separate it into unlike portions. The classification of the elements, in accordance with their chemical properties, necessarily carries with it the classification of many compounds, as much as the chemical properties of an element cannot be stated without considering the composition, general chemical behaviour, and conditions of formation, of compounds of that element. For instance, certain elements are placed in the same class because they all form hydroxides which are alkaline; this statement implies an acquaintance with the composition, methods of production, and chemical properties, of the alkali; but one of the chemical properties of an alkali is that it neutralises acids, and in so doing forms salts; hence it is necessary to know something about acids and salts, in order to understand what is meant by an alkali, or by an alkali-forming element.

The elements may be classified in accordance with their physical properties. If a binary compound is electrolysed, one of its elements separates at the positive electrode, and the other at the negative electrode (secondary reactions which may occur are supposed to be overlooked). That element which separates at the positive electrode is said to be electro-negative to the other element. By studying the electrolysis of binary compounds, the elements are placed in an electrolytic series. This series may be divided into two parts: all the elements on one side of any chosen element are electro-positive to all the elements on the other side of the chosen element. Taking hydrogen as the central element we are able to subdivide the elements into two classes; all the elements on one side of H are electro-positive to the elements on the other side of H. Thus we arrive at a classification of the elements founded on one chemical physical property. Now we find that the electro-positive elements, on the whole, more resemble one another in certain physical properties, and also in their general chemical character, than they resemble the electro-negative elements. Those elements which are electro-positive to H as a class are greyish-white in colour, lustrous, fairly malleable and ductile, comparatively good conductors of heat and electricity; those elements which are electro-negative to H vary much: in colour and appearance, they are not usually lustrous, they are generally brittle, and they do not conduct heat or electricity well. Turning to the chemical properties of the two classes of elements, we find that those placed in the electro-positive class generally combine with O to form basic oxides; their compounds with O and H are also usually basic; they do not, as a rule, enter into the composition of acids; very few of them form hydroxides; their haloid compounds, as a whole, are tolerably stable as regards the action of heat, and they are not readily decomposed by water; if they are thus decomposed they generally produce oxyhaloid compounds; speaking broadly, these elements do not exist in allotropie forms. On the other hand, we find that most of the elements which are placed in the electro-negative class combine with O to form oxoacids; their compounds with H and O are usually acids. All acids contain one or more of these elements; they generally form hydrides; many of their haloid compounds are decomposed by heat, and many of them are also decomposed by reacting with water, thereby producing haloid acids and either oxides or oxyacids of the electro-negative elements; speak-
ing broadly, these elements exhibit the phenomena of allotropy.

Hence, it would appear that the division of elements into two classes, those which are electro-positive to H, and those which are electro-negative to H, is a good classification, because with this one class-mark many other properties, both physical and chemical, are associated.

The electro-positive elements are called metals; the electro-negative elements are called non-metals.

A further examination of metals and non-metals shows that the classification implied in these terms is very far from being sufficient for chemical purposes. We cannot define the term metal; just as we cannot define any of the chemical names which are given to classes of bodies. We can sketch the ideal metal. Considered physically, the ideal metal is a hard, fairly heavy, greyish-white, lustrous, malleable, ductile substance, consisting of solid, which melts only at a high temperature; it is a good conductor of heat and electricity, it crystallises in forms belonging to the regular system; its emission-spectrum consists of lines, and is comparatively simple in character. Considered chemically, the ideal metal is hardly, if at all, changed in the air, it combines with O at fairly high temperatures, and forms one or more oxides which are basic, i.e., which react with acids to form salts; it reacts with water or steam to produce an oxide or hydroxide and evolve H2O; no hydride of the ideal metal is known; it does not enter into the composition of acids, but it reacts with acids to form salts; its sulphides react with acids to produce salts and evolve H2S, they combine with the sulphides of decidedly electronegative elements; the salts of the ideal metal are numerous and stable; it forms but few acid salts, but the number of double salts into which it enters is large; it combines directly with the halogens, producing compounds which are volatile without decomposition at rather high temperatures, and which dissolve in water without change; the ideal metal forms alloys with elements of its own class, which alloys belong rather to the group of physical, than to that of chemical compounds; lastly, the ideal metal exists in only one modification, i.e., it does not show allotropy. The ideal non-metal is the opposite, chemically and physically, of the metal.

No element exhibits all the properties which we have placed in the category 'metal'; nor is there any element which possesses even some of these properties without at the same time also possessing some of the properties which belong to the typical non-metal.

The elements sodium and potassium possess most of the chemical properties enumerated as characteristic of metals; but these elements are instantly oxidised by exposure to air; they probably form unstable hydrides; they are very soft, lighter than water, and melt at moderately low temperatures.

The element gold possesses most of the physical properties characteristic of metals; but its hydroxide reacts with alkalis to form salts, e.g., KAuO2; Au also forms the acids H2AuBr4 and H2AuCl4; Au, S combines with the sulphides of non-metals.

The very metallic elements K and Na to form salts. The element chromium exhibits many of the characteristic physical properties of metals; it also decomposes steam with evolution of H; it combines with the halogens to form stable compounds, some of which have been gasified at high temperatures; chromium does not form a hydride; the oxides CrO and Cr2O3 are basic; the element reacts with many acids to form salts, which are well marked, stable compounds; it does not exist in allotropic forms.

On the other hand, Cr2O3 is a distinctly acidic oxide, reacting with water to form the acid H2CrO4, from which is obtained a large number of salts. In other words, chromium belongs to the class metals, and also to the class non-metals. In an even more marked way than Cr, manganese combines in itself both metallic and non-metallic properties.

The chemical properties of an element depend on the properties of the other elements with which it combines, and on the quantities of these other elements entering into combination. It is this fact which makes it impossible to apply the definition of metal or non-metal, in its entirety, to any element. The classification of elements into metals and non-metals is nevertheless a useful one, provided it is employed with judgment and knowledge. If we find that a certain element is hard, lustrous, unchanged or only slowly changed in the air, and is a good conductor of electricity, or if we find that the oxide of a certain element is basic, and that the chloride is not decomposed by water, or if decomposed produces an oxchloride, we have at once a guide to lead us in our further examination of the element. We shall probably find that the element in question possesses several of the other physical characteristics of metals; and we shall also probably find that it reacts with acids to form salts, decomposes steam with evolution of H, produces at least one sulphide which combines with sulphides of some of the negative or non-metallic elements, and so on.

The following division of the elements usually placed in the class metals is that arising from the application of the periodic law.

**CLASS I. division 1:** Li Na K Rb Cs

**CLASS II. division 1:** Be Ca Sr Ba

**CLASS III. division 1:** Sc Yt La Yb

**CLASS IV. division 1:** Ti Zr Ce Th

**CLASS V. division 1:** V Nb Ta

**CLASS VI. division 1:** Cr Mo W U

**CLASS VII. division 1:** Mn

**CLASS VIII. division 1:** Fe Ni Co (Cu)

**CLASS IX. division 1:** Rh Ru Pd (Ag)

**CLASS X. division 1:** Os Ir Pt (Au)

The metals in division 1 of Class I are generally known as the alkaline metals. They possess in the most marked way the chemical characters of the ideal metal; none of their compounds exhibits any acidic functions; they are electro-positive to all the other elements. The metals...
METALS.

in division 2 of Class I. are very distinctly metallic in their physical properties; chemically considered they show considerable differences among themselves; several compounds of gold are almost non-metallic in their reactions, the chemical and physical analogies of this element are best represented by placing it both with Cu and Ag, and also with Os, Ir, and Pt, in division 3 of Class VIII.

The alkaline earth metals which form division 1 of Class II. are more metallic in their physical properties than the metals placed in division 1 of Class I.; chemically they are also distinctly metallic. Coming to Mg, Zn, Cd, and Hg, which form division 2 of Class II., we have four elements whose properties closely approach those of the ideal metal; Cd may be taken as on the whole the best actual representative of the class metal. As we pass to the higher classes we find many metals exhibiting properties characteristic of non-metals, until in Class VII. we arrive at Mn, an element which is at once distinctly metallic and decidedly non-metallic in its chemical properties.

In connexion with the subject of this article, references should be made to the following articles wherein the different classes of metals are described—Alkali Metals, Metals of the Vol. i. p. 112; Alkaline earths, Metals of the Vol. i. p. 111; Chromium group of Elements, Vol. ii. p. 168; Copper group, Vol. ii. p. 260; Earths, Metals of the Vol. ii. p. 424; Iron group, Vol. iii. p. 89; Magnesium group, Vol. iii. p. 163; Nitrogen group (for Class V., V to Bi), Vol. iii. Supra; Noble Metals, Vol. iii. Supra; Titanium group, in vol. iv.; Tin group, in vol. iv.

M. M. P. M.

METALS, RARE. Under this name are included a number of presumed elementary bodies concerning which our knowledge is at present very imperfect. We see that in their general properties they approximate more or less closely to cerium, yttrium, and lanthanum, but we are not sure how far we have yet obtained them in a state of purity. Consequently we are in doubt as to their number and their rank as elements, compounds, or mere mixtures. Our ignorance is due to the great rarity of these bodies, to the high complexity of the minerals in which they are found, but most of all to the fact that they differ among themselves merely by very minute shades.

The principal sources of the rare metals are gadolinite, keithitite, fergusonite, euxenite, cerite, and thorite, which are Norwegian minerals, and further, samarskite, which was first obtained from the Urals, but has since been found in relatively large quantities in North Carolina. It pointed out that specimens of any one of these minerals, if from different localities, are not identical in the earths they contain. Hence if it is desired to isolate any particular earth is best to select as the first material that mineral in which nature has, so to speak, commenced the task of separation. This method was proposed and adopted in the chemical section of the British Association, Birmingham Meeting (C. N. 54, 128; ibid. 54, 157; Fr. 40, 505.) Nilson a. Kriiss have since adopted and recommended the same method (B. 20, 2184; C. N. 56, 74, 85, 185, 145, 184, 165, 172).

The recognition of the various rare earths is a matter of no little delicacy. Here spectroscopy in its several modifications renders the greatest service. In endeavouring to ascertain by this means what substances are present in a mineral containing rare earths, chemists may employ either the spark-spectrum, the absorption-spectrum, or the incandescence- or the phosphorescence-spectrum. They may further apply any of these tests either at once to the original mineral, or to some of its portions after a partial separation has been effected by chemical treatment. The question of course arises, how are we to know when we have obtained any one earth separated from all other bodies, and absolutely pure? In the case of those earths and their solutions which present an absorption-spectrum, e.g. didymia, samaria, holmium, erbia, &c., the writer has shown that as an element approaches simplicity the absorption-spectrum of its solutions will become less and less complicated; hence it would appear that when absolutely free from its associates, each element would have an absorption-spectrum of great simplicity, in many cases consisting of one band only (the 'one band, one element' hypothesis). But as certain earths, e.g. lanthana, mesandra, philippia, scandia, terbia, &c., give no absorption-spectra, this test is not applicable in all cases.

Great caution is required in drawing conclusions from the examination of spectra. Concerning the influence of one body upon another little is yet known, but that little is of sufficient importance to make us very careful how we interpret absorption-spectra when not corroborated by chemical results. Leuco de Boisbaudran a. J. Lawrence Smith have pointed out some important modifications produced in absorption-spectra by the presence of an excess of acid in the solution (C. R. 88, 1167). Soret subsequently verified these observations. Brauner and others have put on record experiments on mixing solutions of didymium and samarium. They find in the case of a didymium solution showing the group of three bands, 476, 490, 420 [l/M 4394, 4113, 4546], that, by adding a drop of solution of samarium, these three bands vanish, without the appearance of any of the samarium bands, until a certain proportion is reached, when the samarium bands gradually come into their places (Brauner, C. J. 45, 288).

Many of the earths that do not yield solutions giving absorption spectra can be made to give characteristic spectra by phosphorescence. This is known as the 'radiant matter' test. When the spark from a good induction-coil traverses a tube having a fiat aluminium pole at each end, the appearance of the spark changes according to the degree of exhaustion. If atmospheric air is the gas under exhaustion, at a pressure of about 7 mm. a narrow black space is seen to separate the luminous glow and the aluminium plate connected with the negative pole of the induction-coil. As the exhaustion proceeds this dark space increases in size, until, when the pressure is about 0-02 mm., the dark space nearly fills the tube; the luminous cloud showing the presence of residual gas has almost disappeared, and the molecular discharge from the negative pole
begins to excite phosphorescence on the glass where it strikes the side. There is a very wide difference in the degree of exhaustion at which various substances begin to phosphoresce. Under the influence of this discharge of 'radiant matter,' a great many substances Earth, when once or less intensely, a phosphorescent light. On examining this light in the spectroscope, most of these bodies give a faint, continuous, spectrum with a more or less decided concentration on one part of the spectrum. The superficial colour of the phosphorescent substance depending on this phosphorescent light is dis-continuous.

If we examine the 'rare earths by this 'radiant matter' test we find they present a very striking characteristic. Some of them remain unaffected, and are thus at once referred to a distinct group. Others, such as thorium, do not phosphoresce and offer great obstruction to the passage of the spark. Other earths become very phosphorescent and vary greatly in power of phosphorescence. On examining phosphorescent earths glowing in a vacuum, the writer found remarkable differences in the duration of this residual glow. Some of the earths remain luminous for many minutes after the cessation of the current, while others cease to phosphoresce immediately on the stoppage of the current. Take the case of yttria. This earth, the writer finds, can be resolved by chemical treatment into a series of simpler bodies of unequal basicity, to which he has given the provisional designations of Ga, Gb, Gc, Gd, and Gs. The after-glow of these bodies differs somewhat in colour from that which the earth exhibits while the current is still passing. The spectrum of the after-glow also shows that some of the lines are missing. In the electrical phosphorescope—an instrument similar to Becquerel's phosphorescope, but having the substance placed on electrically instead of by direct light—the different bands of the new constituents of yttria (u. tin/v/5) do not all appear at the same speed of rotation. At the lowest speed the double greenish-blue band of Gs is first seen, followed next by the dark-blue band of Ga. As the velocity increases there follows the bright citron-yellow band of Gs, and as the utmost speed approaches the red band of Gc is seen, but not without difficulty. As another instance, if lanthanum sulphate with traces of Sm as impurity, along with a few milligrams of phosphorescent in the phosphorescope, the band of Gc is visible at the lowest speed; Gs follows at an interval of 0.035 second, and the Ga band immediately afterwards. All the earths of the yttrium and samarium groups yield discontinuous spectra when submitted to the induction discharge in vacuo.

A modification of phosphorescence-spectroscopy is produced by the previous addition of other elements to the specially phosphorescent earths. Lime exerts a remarkable action. By itself, it phosphoresces with a continuous spectrum. Mixed with phosphorescent earths, it produces with a discontinuous spectrum. But if these two bodies are mixed together, the phosphorescent energy of the lime does not extend over the whole spectrum, but concentrates itself in strengthening the yttria bands. These bands become broader, but at the same time less sharply defined, in proportion as the lime is increased in quantity. Lime also brings out the phosphorescent bands of samaria. It also suppresses the sharp line Gs, the most striking feature in the phosphorescent spectrum shown by pure samarium sulphate. On the other hand an addition of old yttria deadens the other lines of samaria, but brings out the line Gs more strongly. Lanthanum sulphate in the 'radiant matter' tube phosphoresces with a reddish colour. If lime is added to lanthanum sulphate the phosphorescence changes its colour from red to yellow. Lime also brings out the bands of yttrium and samarium if these are present as impurities. So sensitive is this test that it will show the presence of one part of yttria or samaria in more than a million parts of lime. With Gc, Gb, and Gs are present in small proportions with lime the bands of Gs and Ga become intensified, but a dark space appears instead of the green band of Ga. Hence if only a small trace of Gs is present in lime the green band is not only obliterated, but the quantity remaining is sufficient that part of the continuous lime-spectrum which has the same refrangibility as the Gs line, and thus gives a black space in the spectrum.

There are many instances of the modifications induced in the normal spectrum of one earth by the admixture of others when treated as anhydrous sulphates. One of the most striking instances is that of a mixture of samaria with yttria, since the presence of even 20 p.c. of yttria practically obliterates the spectrum of samaria. The most minute proportion of lime added to samaria causes the sharp line at $1/2\times 269$ to vanish, while at the same time it much intensifies the other bands (T. R., pt. ii. 1885; C. R., June 16, 1885). The action of lime upon yttria is of great use in detecting very minute traces of this earth when in admixture with elements which would otherwise prevent its phosphorescence.

Alumina is also active in inducing new spectra when mixed with the rare earths. A moderate amount of fractionation has enabled the writer to penetrate beneath the veil of red phosphorescence observed in crude alumina and to see a complicated sharp-line spectrum (C. N., 56, 62, 72). The new body of which glimpses have been obtained is probably one of the unknown earths in decipia, since the new spectrum may be fairly reproduced by adding one of the fractionations of decipia to alumina. Hence, it will be seen that the performance of a long series of check and counter-check experiments often becomes necessary before the presence or the absence of any particular earth can be inferred.

The quantitative separation of the rare metals is much more difficult than their mere recognition. These substances are not linked to one another, or to other elements with which they are associated, by any strong affinities, but they are nearly identical in their behaviour and properties. Hence we have so far been unable to find any reagent or any mode of treatment which at once quantitatively separates one of these substances from all the others. We are therefore obliged to have recourse to tedious processes of fractionation.
In attempting to enumerate or describe the rare metals, we meet with the additional difficulty that the unitary character of many of them is still a matter of extreme doubt.

Several of the rare metals will be found described in their proper alphabetical order in this Dictionary, e.g., berillium, cerium, didymium. Many of these, as will be seen below, are probably capable of being further split up, but as they are frequently mentioned in chemical treatises and memoirs their description as at present, or lately, known has been found necessary.

There are certain other metals which are still under discussion, e.g., decipium, philippium, holmium (Soret's X), and dysprosium. Roscoe has indeed proved that philippium is a mixture of terbium and yttrium, and the experiments of the writer have confirmed his results; but until we know more about the constitution of terbium and of yttrium, both of which are undoubtedly compound bodies, these experiments do not carry us much further. Samarium is also identical with a body which other chemists have named 'yttrium A.'

It has been mentioned elsewhere that the old didymium, after the elimination of Delafontaine's decipium, was found by Lecom de Boisbaudran to contain another body, which he named samarium, characterized by the bands of Delafontaine's decipium, together with two new bands (figs. 1 and 2). After the removal of these bodies the residual didymium was split up by Auer von Welsbach into the two bodies, neodymium and praseodymium, the absorption-spectra of which are shown respectively in figs. 3 and 4. It will be observed, however, that two of the bands of old didymium are not to be found in the neodymium and praseodymium spectra taken conjointly. Hence it becomes extremely probable that there exists a third body distinct from neodymium and praseodymium to which one of these extra bands, or possibly both, is due. This probable metal the writer has provisionally named Da. But while we encounter the question whether neodymium, praseodymium, and Da are ultimate elements, or are capable of still further scission. The researches of several investigators point very decidedly in the latter direction. Thus Nilson a. Krüss in 1887 appear to have obtained from didymium no fewer than nine bodies, each of which may possibly prove to be an element. These bodies have been provisionally named by the discoverers Di1, Di2, Di3, Di4, Di5, Di6, Di7, Di8, and Di9.

It seems to the writer that neodymium and praseodymium are simply the products into which the original didymium is split up by one particular mode of attack. Any single chemical operation, whether it be crystallization, precipitation, fusion, partial solution, &c., can only number of reagents, operations, or processes in regular use, and if a substance resists all these and otherwise behaves as a simple body, they call it an element. But for all this it may prove to be a compound. Hence, we may legitimately pause before conceding to neodymium and praseodymium the rank of elements. We need some criterion for an element which shall appeal to our reason more clearly than the old untrustworthy characteristic of having not as yet been decomposed; and to this point chemists would do well to turn their most serious attention.

In samarium the writer, by means of the 'radiant matter' test, has recognized four bodies, named provisionally B8, Gs, Gy, and G6. Very similar observations seem to prove that, like didymium and samarium, erbium, holmium, thulium, dysprosium, &c., are compounds or mixtures of a number of closely allied bodies.

In order to ascertain the existence of supposed new elements chemists have proposed a test that certain absorption-bands seen in different solutions follow the same variations of intensity. If this is the case we may infer that they are all characteristic of one and the same substance. But if one of the bands dies out while others remain unaltered we may judge that two or more distinct bodies are present.
In erubium the writer has detected two bodies, which he has characterised by their absorption bands \( \lambda 5050 \) and \( \lambda 498.5 \). Krüss and Nilson apply the name 'erbia' to these. The name ' erbia ' has been given to two bodies which are not identical. The substance which ten years ago was called erbia, and which was then supposed to be the oxide of a single metal, has been resolved by the investigations of Delafontaine, Mariage, Soret, Nilson, Clève, Braunier, and others into at least six distinct elements. Three of these—scandia, ytterbia, and terbia—give no absorption-spectra, while three others—erbia (new), holmia, and thulia—give absorption-spectra. The first to question the elementary character of old erbia was Delafontaine (C. R. 87, 559; C. N. 38, 202). He obtained from it and described philippia, a yellow oxide having a strong band in the violet (\( \lambda 4000 \) to 405), a broad black absorption band in the indigo-blue (about \( \lambda 4500 \)), two rather fine bands in the green, and one in the red. Soon after, Delafontaine discovered, Soret (C. R. 89, 521; C. N. 40, 224) stated that he was unable to identify 'Soret's X' with Delafontaine's philippia, the latter being characterised by an absorption-band in the blue occupying the same place as one of the erbia bands. In 1880 Delafontaine (C. R. 90, 221; C. N. 41, 72) described ten new earths as present in gadolinite and samarskite, viz., mosandra, philippia, ytterbia, decipia, scandia, holmia, thulia, samaria, and two others to which he did not assign names. He concluded that the properties of philippia were identical with those of Soret's X and of Clève's holmia, and proposed that the name holmia should be set aside in favour of philippia. In C. R. 91, 328 (also C. N. 42, 185), Clève repeated his earlier assertion that philippia was not identical with Soret's X or holmia. Delafontaine then withdrew his statement and said about the absorption-spectrum of philippia and decipia they were the same as that of seppie (Archives de Genève [2] 999, 15). Lastly Roscoe (C. J. 41, 277) gave an elaborate account of the earth metals in samarskite, proving philippia to be a mixture of yttria and terbia. The present writer, after prolonged chemical examination of these earths, has come to a similar conclusion; but a spectroscopic examination of the earth left on igniting some very carefully purified crystals of philippium formate, tested in the radiant matter tube, has shown that in the separation of Delafontaine's 'philippium' the yttria undergoes a partial fractionation. Shortly after the announcement of philippium, Soret (C. R. 86, 1062) described an earth to which he provisionally named X. It was subsequently found to be identical with Clève's holmia (C. R. 89, 479; O. N. 40, 126). The absorption-spectrum of this earth is marked by a very strong band at \( \lambda 451.5 \), \( \lambda 475 \), \( \lambda 556 \), and \( \lambda 427.5 \). The absorption-spectrum of what may be called new holmium, consisting of at least two elements: one of these he has named dysprosium, reserving the name holmium for the residue left after the elimination of the dysprosium. The absorption-spectrum of dysprosium shows four bands, \( \lambda 451.5, \lambda 475, \lambda 556.5, \) and \( \lambda 427.5 \). The absorption-spectrum of what may be called the new holmium is shown in fig. 8. What relation this new holmium bears to any of the components observed in the original spectrum of holmium by Krüss and Nilson is not as yet determined.

The writer (Pr. 40, 502) obtained an earth by repeated fractionation, in which one of the bands ascribed to dysprosium, that namely at \( \lambda 451.5 \), was very strong, though the others were absent. As de Boisbaudran regards the bands \( \lambda 475 \) and \( \lambda 451.5 \) as both belonging to dysprosium, and as the earth obtained gives \( \lambda 451.5 \) strong but with scarcely a trace of \( \lambda 475 \), dysprosium consists of at least two simpler bodies. Krüss and Nilson in fact resolve it into three bands to which they gave the provisional names Xc, Xe, Xn, and de Boisbaudran gives the absorption-spectrum of dysprosium as shown in fig. 9.

Simultaneously with the discovery of holmia, Clève announced the separation of a second earth from erbia, which he called thulia. Its absorption-spectrum consists of a very strong band in the red \( \lambda 680 \) to 707, and one in the blue \( \lambda 464.5 \) (fig. 10). The ultimate character of thulia is by no means established. Krüss and Nilson resolve it into two bodies, Tma and Tm\( \beta \). Nevertheless the atomic weight of thulia has been determined as 170.7, and the composition \( \text{Tm}_2\text{O}_3 \) has been assigned to its oxide, determinations which for the present must be regarded as premature.

Further, it must be mentioned that the spectrum of old erbia has two faint bands, one at \( \lambda 550 \) and a second broader one at \( \lambda 492 \) (fig. 11). These bands are not as yet under investigation, and we have no clue as to the nature of holmium, thulium, dysprosium; or the new erbia (fig. 12). In a long-continued fractionation of the erbia group of earths, conducted with an ample supply of the old erbia, the writer finds an earth giving these two bands concentrated at one end, the bands becoming stronger, while at the same time two other bands make their appearance. This phenomenon indicates the existence of another earth as yet unknown, belonging to the erbia group.

We next come to the yttrium group, comprising the metals yttrium, terbium, gadolinium, ytterbium, scandium, mosandrium, columbium, and rogerium. Of these yttrium, terbium, ytterbium, and scandium form the subject of distinct articles in this Dictionary.

Columbium and rogerium were discovered in the samarskite of North Carolina by J. Lawrenson & Smith in 1875 (A. R. S.), two characteristic bands in the orange and green (\( \lambda 640 \) and \( \lambda 530 \)), with fainter lines in the more refrangible part of the spectrum, and a number of bands in the ultra violet (see fig. 7). The claim of holmium to rank as an element has been disputed by Nilson and Krüss, who assert that it consists of, or at least contains, four distinct bodies, provisionally named Xe, Xc, Xn, Xx. By submitting Soret's X to fractional precipitation, and examining the fractions spectroscopically, Lecoq de Boisbaudran found that this X, otherwise holmium, consisted of at least two elements: one of these he has named dysprosium, reserving the name holmium for the residue left after the elimination of the dysprosium. The absorption-spectrum of dysprosium shows four bands, \( \lambda 451.5, \lambda 475, \lambda 556.5, \) and \( \lambda 427.5 \). The absorption-spectrum of what may be the new holmium is shown in fig. 8. What relation this new holmium bears to any of the components observed in the original spectrum of holmium by Krüss and Nilson is not as yet determined.
of terbium, yittrium, erbium, didymum, and philippine. In November 1878 and in September 1879 Smith reassessed the elementary character of monadum. He states that its compounds are of a deep orange colour, that its double potassium sulphate is not easily soluble, and that its equivalent weight is 51-2. No recent and valuable investigation has alleged metal have appeared, and its existence must in the meantime be regarded as exceedingly doubtful.

Decipium has been considered as holding an intermediate position between the didymum and the yttrium groups of rare metals, but its elementary character is very questionable. It has not formed the subject of any recent researches. It is said to show a characteristic absorption band about 416.

Gadolinium, otherwise known as the Y of Morgan, gives no absorptive spectrum. In the writer's investigations its phosphorescent spectrum was found to consist of those of two of the constituents of yttrium, which will be mentioned below.

Yttrium proves to an exceedingly complex substance. The body to which all chemists would have applied the name yttria as recently as four years ago may be split up into possibly six, but certainly five, bodies, Ga, Gα, Gβ, Gγ, and Gq, two of which, Gβ and Gγ, are also met with as the components of gadolinium. Hence it is convenient to speak of the original substance as 'old yttria,' and to remember that such is its substance to which everything written concerning yttria prior to 1885 will be found to refer. Fig. 13 shows the simple phosphorescent spectra of the several components into which yttria may be split up by fractionation. If these components are taken in the order of their apparent basacity—the chemical analogue of refrangibility—the lowest of these constituents gives the deep-blue band Ga; then follows a strong citron band, Gb, which increases in sharpness as it becomes more separated from its associates until it may finally reach a red band, Gγ, then a crimson band, Gy; and, lastly, very close together a pair of green-blue bands, Gβ.

The diagram, fig. 14, shows a series of nineteen phosphorescent spectra obtained from a prolonged examination of 'old yttria.' The central spectrum, #, is approximately that given by crude 'old yttria,' though this differs slightly according to the mineral from which the old yttria is extracted. After a time fractionation splits up the earth into two earths here marked # and x, giving slightly different spectra. Fractionating # gives Ga and $, while on fractionation yields x and #. It must not be thought that there is so great a difference between any two adjacent spectra as is here shown. To make the diagram accurately represent what is actually seen in the laboratory it would be necessary to place between each of these nineteen spectra about 1,400 intermediate spectra which it is intended will be seen that a strong band at $47 [1/\lambda^{2} 289]$ is at its maximum intensity from 0 to x, when it rapidly disappears and is not seen beyond c and x. The component giving this band has the names provisionally $4$. The next band in the red $A_{4} [1/\lambda^{2} 279]$ reaches its maximum at x or even higher, and fades out between x and z. The band at $A_{19} [1/\lambda^{2} 281]$ has its maximum between x and o, dying out rapidly below but being more persistent above. It is called Gc. Then comes an extremely sharp band $A_{609} [1/\lambda^{2} 286]$ which appears to belong to an earth absent in gadolinite but present in samarite and a few other minerals. Its greatest brilliancy is between x and z, and on either side it dies rapidly away. For this the writer proposes the name Sc. Then follows a double orange band, and its two components, though very closely united, are probably capable of separation. The maximum brightness of the first component $A_{609} [1/\lambda^{2} 275]$ extends from o to the top of the figure. The second component $A_{407} [1/\lambda^{2} 280]$ begins to fade about q, and is at its greatest brilliancy at the highest spectrum shown on the figure. This band occurs almost isolated in a specimen of crude lanthanum, and may be provisionally called Gq. Next follows the citron, or Gb band, $A_{674} [1/\lambda^{2} 305-5]$ which is the most prominent feature in the spectrum of old yttrium. This band extends with scarcely diminished sharpness from o to s; above o it fades rapidly and disappears above b. Then comes a double green band separable into two components. The first of these, $A_{608} [1/\lambda^{2} 310]$ is nearly absent in $, reaches a maximum at b, and disappears at k. The second member of this green pair, $A_{568} [1/\lambda^{2} 315]$ has its maximum at $ and extends only to n. The substance producing this pair of bands may be called for the present Gy. Then comes a pair of bright green bands which so far show no signs of dividing. They begin at z, reach a maximum at x, and continue with scarcely diminished brilliancy to q. The body giving this double green band is remarkably persistent and may provisionally be called Gβ. Next comes a dark interval followed by a broad, hazy, double-blue band, with its centre at $A_{482} [1/\lambda^{2} 430-5]$; this band appears at r and grows brighter to the last fraction at s. The substance to which it is due is called Ga.

Lastly, at $A_{466} [1/\lambda^{2} 481]$ appears a deep violet band beginning at about x and brightening as we proceed lower down. In some samples of ytterbia, supposed to be pure, this band is intensely brilliant, but it is absent in a specimen received from Nilson and considered by him to be perfectly pure. Hence it is probably due to another new body which may be provisionally named Sγ.

It must be remarked that the writer's fractionations have been carried far beyond the limits shown in the diagram. Fractions above o and below s afford evidence that the process of differentiation has not yet reached its utmost limit.

On the left side of the diagram will be seen chemical symbols attached to some of the spectra. Thus the top spectrum, $, is the one shown by samarium. At o is the spectrum of Marignac's Ye, or gadolinite. o shows the spectrum of mosandrum, and x that extracted is pronounced to be pure yttrium. A careful study of this diagram will lead the observer to conclude that samarium, gadolinite, mosandrum, and yttrium are not true chemical elements but compounds, or perhaps very intimate mixtures, of certain simpler bodies. For these bodies the name 'meta-elements' is proposed (W. Crookes,
**METALS, RARE.**


De Boisbaudran likewise finds yttrium to be a complex body, and recognises in it three distinct substances which he names Zα, Zβ, and Zγ new yttria (C. R. 103, 627). It is possible

*Fig. 14.—Phosphorescence-spectra of components of 'Old Yttria.'*

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*The scale is 1/10.*

*Science Physiques, 16, No. 5 and C. N. 57; W. Crookes, Pr. Feb. 10, 1887.*

*De Boisbaudran likewise finds yttrium to be a complex body, and recognises in it three distinct substances which he names Zα, Zβ, and Zγ new yttria (C. R. 103, 627). It is possible*
METALS, RARE.

The right of the 'new yttria' to bear this
name is in the highest degree questionable. De
Boisbaudran assigns to it an atomic weight close
upon 89, and states that it has a characteristic
spark-spectrum but gives no phosphorescence-
spectrum either in the radiant matter tube or by
his reversion-process. It evidently cannot be
regarded as the old yttrium, formed from impuri-
ties, since the purest specimens of such yttrium
give a phosphorescence-spectrum in vacuo of
such remarkable intensity that it cannot be due
to mere traces of impurities. Ge, Ge, Ge, Ge,
can no more be spoken of as impurities in old yttrium
than can neodymium and praseodymium (as
assuming them to be elementary) be viewed as
impurities in old didymium.

Marignac's Yeo is probably a compound. The
writer recognises in it two at least of the con-
stituents of yttrium, Ge and Ge.

A. E. Nordenskjöld gives the name oxide of
gadolinium (a totally different body from Marign-
ac's Yeo or gadolinium) to the mixture of earths in
gadolinite which are precipitated by ammonia
and oxalic acid, but not by sulphate of potash.
This mixture consists of yttria, erbia, and yterbia.
A very interesting point is that however different the
minerals from which it has been obtained,
and however the percentage of the rare earths
varies, the equivalent weight of the mixture is
always approximately the same, viz. 261.9.
This value is determined by transforming a weighed
quantity of the oxide into sulphate by digestion
with dilute sulphuric acid, and driving off excess
of water and acid by heating to incipient red-
ness (Nordenskjöld, C. R. 102, 795; W. Crookes,
C. N. 54, 239).

On the other hand, commenting on this, De
Marignac shows that there is sometimes a varia-
tion of 15 p. c. in the equivalent weights of these
natural mixtures of rare earths (De Marignac,
Arch. des Sci. Phys. 17, No. 5).

We have therefore some thirty bodies of
which the so-called rare metals are composed,
or, at least, which they contain; and a variety
of facts points to the conclusion that we have by
no means come to the end. Several even of the
newly discovered signs of a capability of further
splitting up, if they are examined with sufficient
nicety and persistence. It is far from unlikely that
when the various methods of research known as
fractionation have been more generally applied
we may have to deal, not with thirty, but with
nearer sixty, unknown bodies.

But whatever may be the number of these
bodies the question must be raised, What are they?
Are they each and all independent ele-
ments? We have certainly no good a priori
grounds for asserting that the number of ele-
ments now recognised is not capable of consider-
able extension. But before any body can be
accepted as simple it should certainly undergo
a very severe scrutiny, more severe than any of
these newly-discovered bodies has yet undergone.
The case of didymium is here a warning.

'It had been closely examined by some of the ablest
chemists of the time, and had been freed from
several foreign bodies, its atomic weight had
been established, when a novel mode of examina-
tion proved its compound nature.

Paving therefore the completion of a series
of investigations, chemical and optical, which
will probably occupy several generations of
chemists, it may be safest to call these recently
observed bodies not, as yet, elements, but quasi-
or meta-elements. Our notions of a chemical
element have been enlarged; hitherto the ele-
mental molecule has been regarded as an aggre-
gate of two or more atoms, and no account has
been taken of the many compounds with these atoms
have been agglomerated. The structure of a
chemical element is certainly more complicated
than has hitherto been supposed. We may
reasonably suspect that between the molecules
which we are accustomed to deal with in chemi-
cal reactions, and the component or ultimate
atoms, there may intervene sub-molecules, sub-
aggregates of atoms, or meta-elements, differing
from each other according to the positions which
they occupy in the very complex structures
commonly known as didymium, yttrium, and the
like.

W. C.

METAMERISM. This term is generally ap-
plied to those cases of isomerism wherein com-
pounds show identity of elementary composition,
but belong to different types or classes (v. iso-
merism, pp. 79, 80, 81, 88).

METEORITES. As regards composition, meteorites have been divided into two classes; those which consist for the most part of metallic iron and nickel, and those which are chiefly composed of silicates, sometimes accompanied by unoxidised iron and nickel. Iron and nickel are the prin-
cipal constituents of those meteorites which are
mainly metallic. The quantity of Fe varies from 90 to 95 p. c., and of Ni from 5 to 10 p. c.

Co occurs in many meteorites, varying from a mere trace to 2 or 5 p. c.; the other metals found
in small quantities are Sn, Mn, Cr, and Cu;
small quantities of Fe-Ni phosphate, and also
carborundum, phosphate, silicide, and sulphide of Fe
are also frequently found in metallic meteorites.
The silicates which form the chief constituents of
meteorites of the second class are silicate of
Al, Ca, and Na (labradorite), silicate of Ca and
Mg (augite), and silicate of Fe and Mg (olivine).

These silicates are often accompanied by nickel
and iron, also by iron pyrites, and sometimes by chrome-iron, and magnetic oxides of iron.

M. M. P. M.

METHACRYLIC ACID C₇H₆O₃, i.e.
CH₃.CMe.CO.OH. a-Methyl-acrylic acid. [167],
(160-6° i. v.). S.G. 1.10155 (Briühl, B. 14,

Occurrence.—In small quantity in Roman oil
of chamomile (Kopp, A. 199, 89).

Formation.—1. Obtained as ethyl ether by the
action of PCl₃ on oxy-isobutyric (' di-
methoxylic') ether C₆H₁₁.OH.C₆H₁₅.(Frankland
and Duppa; C. J. 18, 109; A. 186, 12; Paul,
186, 92).—2. By the action of fuming HBr on cito-
acid, mesaconic acid, or citraconic anhy-
dride, the resulting bromo-pyrotaartaric acid
being boiled with conc. NaOHaq. (Fittig, A.
188, 95; B. 10, 517).—3. By boiling citra- and
mesa-
chloro-pyrotaartaric acid with alkalis (Frehn,
A. 188, 43).—4. Together with oxy-isobutyric acid,
by boiling a-bromo-isobutyric acid (1 pt.) with
water (25 pts.) (Thomson, A. 200, 86).

Preparation.—Citraconic anhydride is mixed
with a saturated solution of HBr (2 vols.) at 0°.

In a few days a mass of crystals of citra-bromo-
pyrotaartaric acid is got. These are collected,
boiled with Na₂CO₃, acidified with HCl, and distilled. The distillate is neutralised by CaCO₃, filtered, evaporated to dryness, and mixed with H₂SO₄. The acetic acid separates as a light oil (Fittig et al. Kolbe, J. gr. [2] 25, 372).

Properties.—Long prisms (from water), with strong but not unpleasant odour. V. sol. water, v. a. sol. alcohol and ether.


5. Methacrylic acid dissolves easily in fuming HBr even at 0°, the solution, after some time, depositing a crystalline addition-product and a thick oil (Panl, B. 9, 129).—6. Bromine forms CH₄Br₂Cl₂Br₂CO₂H. 7. On contact with cold conc. HCl/AQ or by heating at 70°, it is converted into an amorphous (polymeric) modification. The amorphous solution of this substance gives white pps. with Ba and Ca salts. It is not altered by conc. H₂SO₄ and HNO₃ (Fittig et al. Kolbe, J. gr. [2] 25, 372). Hypochlorite forms chloro-oxysaccharic acid (107°) (c. 250°) (Melikoff, Bl. [2] 41, 311).

Salts.—Ca₂₄H₂₅O₂ : tufts of long needles, v. sol. water. Appears to change on heating to a salt of the polymeric acid (v. Reaction 7).—Ag₂₄H₂₅O₂: needles (from boiling water) scarcely affected by light. Suddenly decomposes at 100°.

Constitution.—Inasmuch as the di-bromoiso-butyrlic acid, formed by the addition of bromine, is converted by boiling water into a bromo-methylene acid that can be reduced to a-oxyisobutyric acid, CH₃CO(OH)CO₂H, it is clear that methacrylic acid is not CH₂CH₂CO₂H but CH₂=CHCO₂H.

References.—Bromo- and Chloro-methacrylic acids.

METHYL-BROMIDE v. Bromo-acetone.

METHYMOLLOBIN — H. pmollobin.

METHANUM — M. ethenol.


Occurrence.—The bubbles of gas given off by decaying vegetable matter in stagnant pools consist of marsh gas, CO₂, and nitrogen. It often escapes into coal mines, where it is known as fire-damp, since it forms an explosive mixture with air. It escapes from the earth in various places in Italy, North America, and especially at Baku on the Caspian. It occurs among the products of distillation of wood, peat, coal, and bituminous shale, constituting 35 to 40 p.c. of coal gas. Methane occurs also in the intestinal gases. It occurs also among the products of the passage of ethylene (Norton a. Noyes, Am. 8, 362) and other gases through a red-hot tube. The gaseous product obtained by heating ethylene at 400° contains 36 p.c. methane and 40 p.c. ethane (Day, Am. 8, 155).


Preparation.—By the action of the copper-zinc couple on an alcoholic solution of Me₅, the escaping gas being well washed with a scrubber containing a further quantity of copper-zine (Gladstone a. Tribe, C. J. 46, 164).

Properties.—Colourless gas. V. sol. water. Much less soluble in alcohol than ethane. Its illuminating power is slight (cf. L. T. Wright, C. J. 47, 300). May be liquefied by combined cold and pressure (Calliet, J. 1877, 321). Methane is not absorbed by aqueous KOH or by amonnia, because the chloride. When compressed with water below 0° under a pressure of 50 atmospheres it forms a crystalline hydrate, the critical temperature of which is 21° at (Villard, C. R. 106, 1602; 107, 395).

Reactions.—1. When passed through a red-hot tube it is for the most part unaffected, but a little naphthalene is formed. Electric spark partially converts it into carbon, hydrogen, and acetylene (Berthelot, C. R. 67, 1188). When passed over a red-hot palladium spiral it is decomposed, if dry, into carbon and hydrogen, and, if moist, into CO and hydrogen (Coquillen, C. R. 86, 1187).—2. It is not attacked by sulphuric acid, by nitric acid, by a mixture of hot conc. H₂SO₄ and HNO₃ by PC₁, or by chlorine in the dark.—3. A mixture of chlorine (2 vols.) with methane (1 vol.) when exposed to sunlight presently explodes. The explosion may also be brought about by an electric spark. Ifthe mixture be first diluted with CO and then exposed to sunlight, the mixture quiet, chlorine takes place, and if excess of chlorine is present chloroform and CCl₄ are formed. A mixture of methane (1 vol.) and chlorine (1 vol.) exposed to diffused daylight gives methyl chloride. In presence of moisture, chlorine forms HCl, CO₂ and CO₂.
METHANE.

A mixture of air and methane passed over a red-hot platinum spiral yields formic acid (Coomes, C. R. 77, 444). When mixed with nitro oxide and fired by an electric spark CO_2 and oxygen are among the products (Cook, C. N. 58, 180).

 Constitution.—That the four atoms of hydrogen in methane are of equal value may be inferred from the existence of only one set of methyl compounds. The same thing may be shown thus:—

From CHHH we may obtain, by treatment with KOH, an acetonitrile CHHHK which we may call ‘a’. From this we can obtain CHHH.CO.H, CHHCl.CO.H, CHHCCO.H, and ‘b’ acetonitrile CHHHK. But from CHHH.CO.H we can obtain malonic ether CHH(CHOEt),(COEt), and thence we can get CHH(CHOEt),(COEt), COCH(COH)(COH), and ‘γ’ acetonitrile CHHCHH successively. The three acetonitriles ‘α’, ‘β’, and ‘γ’ are then found to be identical, hence three at least of the atoms of hydrogen in methane are of equal value.

The fourth acetonitrile might probably be obtained from CH(COEt), via CCl(COEt), and CC(COEt), (Henry, C. R. 101, 1106). Since CO<OH, the product of the action of CO<OH on isobutyl alcohol, is the same as CO<OH, obtained from CO<OH and ethyl alcohol, the carbonyl group is united to two atoms of hydrogen of equal value. Now from aldehyde CO<CH, we may obtain

\[ \text{Cl}_2 \cdot \text{O} \cdot \text{H} \]
whence silver propionate forms
\[ \text{C}_2\text{H}_2\text{O}_2 \cdot \text{O} \cdot \text{H} \],
But from aldehyde we may also obtain
\[ \text{C}_2\text{H}_2\text{O}_2 \cdot \text{O} \cdot \text{H} \],
whence silver acetate yields
\[ \text{C}_2\text{H}_2\text{O}_2 \cdot \text{O} \cdot \text{H} \].

These two acetyl-propionyl derivatives of aldehyde are found to be identical, hence the two atoms of hydrogen in methane which are displaced by oxygen in forming carbonyl are of equal value. It follows that there are two pairs of equivalent atoms of hydrogen in methane (Geuther, A. 205, 209; 295, 290). And since Henry has shown that three of the atoms of hydrogen in methane are equivalent, it follows that the fourth is also so.

References.— TETRA-BROMO, BROMO-ODO, BROMO-METHO, CHLORO-METHO, CHLORO-BROMO, and TETRA-ODO, METHANE, BROMOFORM, CHLOROFORM, and METHYL, and METHYLN COMPOUNDS. In fact, all organic compounds may be regarded as derivatives of Methane (Kekulé).

METHANE CARBOXYLIC ACID is ACETIC ACID.

Methane dicarbonyl acid is MALONIC ACID.

Methane triacetyl acid is MALONIC ACID.

CH(COEt), Formyl triacetyl acid.

Methanol triacetyl acid.

Ethyl ether CH(COEt), (29°), (258°) at 760 mm. (195°-206°) at 140 mm. S.G. 1.100. From sodium malonic ether, benzene and CHCOEt (Conrad and Guthzeit, A. 214, 81; B.

12, 1866; cf. Olazien, B. 21, 3997, 3867). Colourless oil. V. sol. alcohol or ether. In a freezing mixture, it solidifies to long needles or prisms. According to Michael (J. pr. [2] 37, 473) it dissolves readily in dilute NaOH forming CNa(COEt), which may be crystallized.

Reactions.—1. With aqueous KOH at 40° it forms HOEt, K.CO, and potassium malonate. 2. Dilute HSO_4 and alcohol and NaOH at 0° also form malonic acid, so that a salt of the acid CH(COEt), has not been obtained. 3. Chlorine forms CCl(COEt), (Conrad, B. 14, 618).


METHANE PHOSPHONIC ACID v. METHYL PHOSPHINE.

METHANE - TRI - QUINOLYL - HYDRO - INDIDE v. QUINOLINE-INDOFORM.

METHANE SELINIC ACID v. SELENIC ORGANIC COMPOUNDS.

METHANE SULPHONIC ACID CH_3SOH, i.e. CH_3SOH. From ZnMe, and SO_2 (Hobson, A. 106, 267). The aqueous solution of the acid soon decomposes with deposition of sulphur. CaA_2+ (dried at 100°): amorphous. BaA_2+ (dried at 100°): cubes, v. sol. water, insol. alcohol.

MgA_2aq. (dried at 100°): ZnA_2+: amorphous.

Derivative.—TRI-CHLORO METHANE SULPHONIC ACID.

Methane di-sulphonic ether v. METHYL METHYL-DIETHYL DISULPHONIC ACID.

METHANE SULPHONIC ACID CH_3SOH, i.e. CH_3SOH.


SALTS.—NH_2A+: thin trimetric plates (from absolute alcohol).—LiA_2aq. (NaA), NaI (Colman).—K_2+ (dried at 100°).—NaA_2+ (dried at 100°).—CaA_2+, S. 71 at 20° (Nithack, A. 218, 284).—SRA_2aq. S. 83 at 20°.—BaA_2aq. v. e. sol. water, insol. alcohol. MgA_10aq. —PbA_2aq. —CuA_5aq. —AgA_2.

Methane chlorides CH_3SOCl (160°) (N). S.G. 1.61. From the acid and POCl (Carius, A. 134, 142). Not attacked by H_2S or by KCl or KOH (McGowan, J. pr. 290). Decomposes aqueous ammonium with evolution of nitrogen.

Amide CH_3SO,NH_. Formed by passing NH_3 into a solution of the chloride in ether. Not stable to benzene containing alcohol.

Amide CH_3SO,NHPh. Large plates (from alcohol) (McGowan).

Derivatives v. CHLORO, i.e. and CHLORO-BROMO-METHANE SULPHONIC ACID.

" Methane disulphonic acid CH_3SO_2H. Methene disulphonic acid. Methionic acid.

Formation.—1. A product of the action of

Properties.—Very dlibiquous needles. Not attacked by chloroform or by nitric acid.

Salts.—(NH₄)₂A: trimetric crystals, m. sol. cold water.—K₆A: needles 8.7° at 22°.—Ba₂A: 2aq; pearly crystals.—Pb₆A: 2aq; prisms, soluble in alcohol.—Cu₆A: 3aq;—Ag₆A: thin plates.

Derivative v. Bromo-methane disulfonphonic acid.

Methane tri-sulphonic acid CH₃SO₃, i.e. CH₃(SO₃)₂, Obtained by heating CH₃SO₃K (1 pt) with fuming H₂SO₄ at 100° (Theiltaubl, A. 143, 134). Formed also by the action of aqueous K₂SO₄ at 100° on CH₃C(NO₂)₂SO₃K, or on CO₃(NCO) (Bathke, A. 167, 216). Long needles; v. e. sol. water and alcohol.—K₆A:aq; small prisms.—Ba₆A:aq; small prisms, v. sol. water, insol. alcohol.—Ba₆A: 9aq; plates. Not decomposed by HCl.—Pb₆A:q; plates.

Methane thiophosphonic acid. Methyl ether CH₃PO₃, i.e. CH₃SO₃PO₃. Dimethyl disulfophoxide. Obtained by warming dimethyl disulfide with nitric acid (S.G. 1-2) diluted with four times its volume of water (Lukaschitz, B. 1858, 641). Oil. Readily oxidised by HNO₃ to methane sulphonphonic acid.

Methanethrene-quinone + O₂. From methanethrene and CrO₃ in H₂OAc. Minute trimeric laminae. May be dissolved. Insol. water, sol. ether, v. sol. alcohol. Reduced to a hydride by aqueous SO₄.

Methazonic acid CH₃HN, i.e. NO.CH₂O₃ [c. 60°]. The sodium salt is formed by acting on nitro-methane with alcoholic NaOH, the resulting crystalline pulp being heated on the water-bath. The upper (alcoholic) layer is poured off, and the lower layer deposits sodium methazonate on cooling. It is dissolved in water and reppd. by alcohol (Fries, B. 9, 304). According to Lecco (B. 9, 708) it is best to add dilute H₂SO₄ and shake with ether. If the ether is dried with Na₂SO₄ and evaporated over H₂SO₄, it leaves methazon as leafy crystals, which may be recrystallised from benzene. It is v. sol.

water, alcohol, and ether. m. sol. benzenes, insol. petroleum-naphtha. The Na salt crystallises from alcohol in long prisms.

Methenyl-amidine v. Formamidine.

Methenyl-amidoxin v. Formamidoxin.

Methenyl-amido-creosol CH₃NO i.e.


Methenyl-amido-creosol CH₃NO i.e.


Methenyl-amido-phenol CH₃NO i.e.


Preparation.—1. By reduction of the chloro-derivative (vol. ii. p. 78) with tin and HCl or with HI.—2. By the action of formic acid on amido-phenyl mercaptan (Hofmann, B. 18, 14).—3. Formed together with aniline, methyl-aniline, and a base C₃H₇N [117°]. An isomeride of methyl-naphthalene obtained, together with other products, by distilling podcarpic acid with zinc-dust (Oudemans, B. 6, 1125). The product is crystallised from alcohol and sublimed. White laminae with violet fluorescence. It boils above 360°. V. e. sol. boiling alcohol, sol. HCl.

Picric acid compound C₃H₇SCH(NO₂)OH. [117°]. Slender orange needles.

Picric acid compound C₃H₇SCH(NO₂)OH. [117°]. Slender orange needles.

Methanethrene-quinone + O₂. From methanethrene and CrO₃ in H₂OAc. Minute trimeric laminae. May be dissolved. Insol. water, sol. ether, v. sol. alcohol. Reduced to a hydride by aqueous SO₄.

Methazonic acid CH₃HN, i.e. NO.CH₂O₃ [c. 60°]. The sodium salt is formed by acting on nitro-methane with alcoholic NaOH, the resulting crystalline pulp being heated on the water-bath. The upper (alcoholic) layer is poured off, and the lower layer deposits sodium methazonate on cooling. It is dissolved in water and reppd. by alcohol (Fries, B. 9, 304). According to Lecco (B. 9, 708) it is best to add dilute H₂SO₄ and shake with ether. If the ether is dried with Na₂SO₄ and evaporated over H₂SO₄, it leaves methazon as leafy crystals, which may be recrystallised from benzene. It is v. sol.

water, alcohol, and ether. m. sol. benzenes, insol. petroleum-naphtha. The Na salt crystallises from alcohol in long prisms.
METHENYL-AMIDO-PHENYL MERCAPTAN.

Ethynyl-amido-phenyl-mercaptan with NH₃ gives a red colouring-matter C₃H₅N₃S₃I is obtained which crystallises in four-sided violet-red plates with JF // Y. Soln. cold alcohol and on cold, insol. water. Neither of the amylo-iodides when treated separately, in the same way, gives any colouring-matter. In a similar manner to the amylo-iodide, the mixed methyl-iodides give a compound crystallising in reddish-golden plates, sol. alcohol with a scarlet-red colour. Similar colouring with hot alcohol, sol. cold alcohol, insol. water. All the above products are stronger colouring-matters than the cyanine (Hoffmann, B., 20, 2922).

Derivatives v. Amido-, Chlono- and Nitrato.

METHENYL-o-AMIDO-PHENYL MERCAPTAN.

METHENYL-o-CARBOXYLIC ACID C₂H₅CH₇(CO₂H), C₂H₅CH₇(CO₂H).

Formation. — 1. By the action of cold alcoholic caustic potash upon ethenyl-imido-ethenyl-o-aminod-phenyl-mercaptan C₂H₅CH₇(CN)(NH)CH₅CN amonia being eliminated. — 2. In small quantity by oxidation of ethenyl-o-aminod-phenyl mercuric C₂H₅CH₇(C₂H₅CH₇(CO₂H), C₂H₅CH₇(CO₂H), with cold aqueous KMnO₄.


METHENYL-o-AMIDO-TOLYL MERCAPTAN.

C₂H₅(CH₃)₇(CO₂H), C₂H₅(CH₃)₇(CO₂H). (15'). (255'). Prepared by boiling p-amino-m-tolyl-mercaptan with formic acid (Hess, B. 14, 492). Sol. alcohol and ether. Weak base forming unstable salts. (Br₂(CH₃)₇4PICO₄; needles.

METHENYL-o-AMIDOXIN v. FORMAMIDOXIN.

METHENYL-o-AMIDYL-MERCAPTAN.

C₂H₅(CH₃)₇(CO₂H), C₂H₅(CH₃)₇(CO₂H). From the thio-formyl derivative of m-nitro-aniline C₂H₅(CH₃)(Br)CH₇(NHCSH) by oxidising with alkaline K₂Fe(CN)₆ (Gudeman, B. 21, 9540). Heavy oil.

METHENYL-2-BROMO-TOLYLANE - o - DL.


METHYL-ACETIC ACID

METHYL-ACETIC ACID is PROPHONIC ACID. Di-methyl-acetic acid is JASSO-BUTYRIC ACID.

METHYL-ACETYL-ACETATE v. ACETO-ACETIC ACID.

METHYL-DI-ACETONAMINE v. ACETONAMINE.

METHYL-DIACETONONE v. Methyl ethyl ketone.

METHYL-DI-ACETONONE v. Methyl ethyl ketone and D-tetra ketone.

METHYL-N-ACETONE-ALCamine v. ACETONE-ALCamine.

METHYL-TRIACETONINE v. ACETONINES.

METHYL-ACETOPROPHONIC ACID v. ACETYL-BUTYRIC ACID.

METHYL ACETO-SUCCINIC ETHER v. ACETYL-MYTHYL-SUCCINIC ETHER.

METHYL-ACETOFLUORENE v. METHYL-THIOFLUORENE.

METHYL-ACETYL - BENZENE v. Tolu.

METHYL-ACETYL-ACETONE.

— with water: CaA" 2aq.—BaA" 2aq : needles (P.).
—BaA" : amorphous (F.),—BaH2A"; needles, more soluble than the Ca salt (P.).—AgA" aq: bulky white pp.

Mono-methyl ether MeA" (90°); needles—AgMe" aq: white pp. (P.).

Di-methyl ether Me2A". Oil.

Mono-acetic ether EtA" (76°). Prepared as above. Long pointed needles, v. sol. alcohol, ether, chloroform, and benzene; m. sol. C8; sol. water—CaEtA" 2aq: needles or prisms.—BaEtA" 2aq: needles, v. sol. hot, sol. cold. water—AgEtA": white matted needles.

Di-ethyl ether Et2A" (300° to 305°) (F.). Phenyl hydrazide C6H5N2O4 i.e. C6H5O2N2H2H.OH.H.H (212°) (F.).

Phenyl hydrazide of the mono-ethyl ether C6H5N2O4 (134°); crystalline. Insol. cold aqueous alkali.

METHYLISOCETOL C6H5NO i.e. CH=CH.CH2.CH.NMe

Phenyl-di-methyl chloride C6H5.CH2.CH.CH2.NMe

Naphthalene tetrahydride (828°). V. 8° (ca. 82°). Formed from phenylmethacrylic acid by heating with H2SO4 (40 c.c.) and water (60 c.c.); time, 30 min. Chrom. mixture oxidizes it to benzylbenzoinic acid, acetic acid, benzoic acid, anthraquinone, and CO2.

METHYL. The radicle CH3. The name methyl was also given by Frankland and Kolbe (C. J. 1, 60) to dimethyl CH2.N2 now called ethane. The methyl derivatives of hydroxylic compounds are described under the compounds of which they are the ethers: e.g. CH2.O.CH2.OH, the methyl derivative of oxybenzoic acid is described under OXY-BENZOIC ACID.

DI-METHYL-ACETAL so-called. V. vol. i. p. 105.

METHYL-ACETAMIDE v. Acetyl derivative of Methylamine.

METHYL-ACETANILIDE v. Acetyl derivative of Methyl-aniline.

METHYL ACETATE v. ACETIC ACID.

METHYL ACETIC ACID is PROPHONIC ACID. Di-methyl-acetic acid is JASSO-BUTYRIC ACID.

Tri-methyl-acetic acid v. VALERIC ACID.

METHYL-ACETO-ACETIC ACID v. vol. i. p. 22; vol. ii. p. 78.

METHYL ACETO-ACETATE v. ACETO-ACETIC ACID.

METHYL-DIACETONAMINE v. ACETONAMINE.

METHYL-DIACETONE v. Methyl ethyl ketone.

Di-methyl-acetone v. Methyl isopropyl ketone and D-tetra ketone.

METHYL-TRIACETONE-ALCamine v. ACETONE-ALCamine.

METHYL-TRIACETONINE v. ACETONINES.

METHYL-ACETOPROPHONIC ACID v. ACETYL-BUTYRIC ACID.

METHYL ACETO-SUCCINIC ETHER v. ACETYL-MYTHYL-SUCCINIC ETHER.

METHYL-ACETOFLUORENE v. METHYL-THIOFLUORENE.

METHYL-ACETYL - BENZENE v. Tolu.

METHYL-ACETYL-ACETONE.

METHYL-ACETYL-BENZENE v. Tolu.

METHYL-ACIDIC ACID C6H5N i.e. C6H5CH2.CH3


Combines with bromine in the cold, forming C6H5BrCl [44°].

METHYL-ACETYLENE-DI-QUINOLINE

C6H5N2O4 (134°); crystalline. Insol. cold aqueous alkali.

METHYL-ACETYLENE-DI-UREA

C6H5(NO2)2 (105°); crystalline. Insol. cold aqueous alkali.

METHYL-ACETYLENIC 3.2 (Fischer) [114°]. (180°). Formed by heating diphenylamine (50 g.), glacial acetic acid (80 c.c.) and ZnCl2 (85 g.) at 280° for 18 hours. The yield is good (52%) (Bernthsen A. 221, 85). Formed also by heating diphenylamine with acetonitrile at 300° (Bernthsen A. 192, 29). Diametric crystals; mp. 160°. (Bernthsen A. 192, 29). Aqueous KMnO4 at 104° oxidises it very slowly, a product being perhaps quinoline tri carboxylic acid. HNO3 (S.G. 1.83) boiled for 6 hours with methyl-acridine (6 g.) gives tri-nitro-acridine carboxylic acid, which forms a glistering
METHYL-ACRIDINE.

Methyl alcohol occurs also in the product of the distillation of wood (Taylor, J. 1812), Tschek’s Phä. Mag. 50, 815; Danus a. Peligot, A. 15, 1; A. Ok. 58, 5; 61, 198) and of colocynthia (Kalbe a. Lwow, B. 8, 241). It occurs as methyl salt.

Methyl-acridine C₈H₇(CH₃)N(CH₃)


Di-methyl-acridine C₈H₇(CH₃)₂

[139]. Formed by heating phenyl-p-toluclidin (13 g.) with H₂O₂ and ZnCl₂ (18 g.) at 200°C (Bonna, A. 289, 64). Needles or prisms (from alcohol). Volatile with steam. V. sol. alcohol and benzene.


The sulphate is reddish-brown.

Methyl-acridine chloral v. Thi-Chloro-oxy-propl-ACRIDINE.

DI-METHYL-ACRYLIC ACID v. PENTENOIC ACID.

The crude water liquid obtained by the distillation of wood contains methyl alcohol, acetone, acetic acid, methyl acetate, and ammonium acetate. It is separated from the tarry products and redistilled; the first tenth of the distillate is mixed with slaked lime and redistilled; a little sulphuric acid is then added, and the liquid is redistilled and rectified over quick-time. The crude wood spirit gives a strong aromatic odour and turns brown on keeping. It contains methyl acetate, acetone, di-methyl acetic orthohaldehyde CH₃COOH (Danoer, C. J. 17, 222), allyl alcohol, methyl ethyl ketone, and other ketones (Groszsky a. Krämer, B. 9, 1920). Methyl alcohol may be obtained from wood spirit by saturating with fused CaO₄, and heating on a water-bath. The residue is a compound of methyl alcohol with CaO₄, which when distilled with water is decomposed, giving off the methyl alcohol. The distillate is then rectified over quick-time (Kane, A. 19. 184). According to Gould (C. J. 7, 513) it is best to distill the wood spirit with caolin NaOH (in its preparation). May be sublimated: Ba₄S₄: red-brown; Ba₄S₄: brown; Zn₄S₄: brown; Zn₄S₄: red-brown.

METHYL-ESCULEIN v. ESCULEIN.

METHYLAL v. FORMIC ALDEHYDE.

METHYLLALIC ACID v. ALKYLACID.

METHYL ALCOHOL CH₃O i.e. CH₃OH. Oxymethane. Methyl hydroxide. Wood spirit. (Weitnhen, Mol. w. 32, (dissolved) (B. Schaff, 240, 259); (85-89°) (Perkin, J. 45, 456); (66-68°) (Zander, S. 7058, Brühl); 77-7841 (Perkin); S. 8111 (Zander). B. V. 67 (S.); 49-8 (Lassen, A. 102, 55). µ₅ = 1.3832.

B₆ = 19-28 (Brühl). H.P. 61, 460 (Thomas); 61, 400 (Stöhr, J. pr. 24, 383).

H.P. v. Phth. (Thomas), H.C. 175, 600 (Stöhr, J. pr. 140, 187). Compareability: 00010879 at 10°C (Durep, Pr. 25, 836).

Occurrence: Free in the juices of plants (Guthzeit, J. 1867, 505; Maquenne, C. H. 101, 106) and in the aqueous distillate in the fruits of Neriumeum (Guthzeit, A. 177, 844; 240. 240).
The methyl oxalate thus obtained is thoroughly dried by pressure, and the alcohol regenerated by digestion with water at 70°C. To dehydrate the alcohol thus obtained, digestion with baryta, lime, and dried copper sulphate is necessary. Even when prepared from the oxalate methyl alcohol is not quite pure, as it contains bodies which exhibit Lieben’s isodiform reaction. It may be freed from these by dissolving it one-tenth of its weight of iodine, gradually adding NaOH until the liquid is distinctly alkaline, and distilling. The product, rectified over CaO, has a specific gravity of ‘81 at 15°C (Regnault a. Villejean, *A. Ch.* [6] 4, 430; *C. R.* 99, 89). Methyl alcohol may also be prepared by saponifying methyl formate (9 pts.) with NaOH (3 pts.) and water (6 pts.) (Grodzki a. Kramér, *B. 9*, 1928; Bardy a. Bordet, *A. Ch.* [5] 16, 564). Methyl alcohol may be obtained very nearly pure by distilling oil of winter-green with potash, and rectifying the distillate over lime.

Properties.— Colourless mobile liquid, with purely spiritual odour. Burns with a pale flame. Mixtures of alcohol, ether, and other; dissolves fixed and volatile oils and most resins. Hence it is much used as a solvent. In aqueous solution it produces intoxication, in concentrated solution it is poisonous. When perfectly dry it dissolves a little CuSO₄, acquiring a bluish-green colour; but it does not dissolve crystallised CuSO₄.7H₂O (Klepl, *Z. pr.* [2] 305, 391). Methyl alcohol is ethereified by acetic acid more rapidly and completely than any other alcohol (Menschütkin, *Z. P.* C. 1, 611). Dittmar a. Fawcett give the specific gravity of mixtures of methyl alcohol and water as follows:

<table>
<thead>
<tr>
<th>Weight p.c. of methyl alcohol</th>
<th>Specific gravity of alcohol</th>
<th>Weight p.c. of methyl alcohol</th>
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<tr>
<td>50</td>
<td>0.7645</td>
<td>100</td>
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Estimation.—Pure methyl alcohol does not give Lieben’s isodiform reaction with iodine and potash.

The amount of methyl alcohol in commercial wood spirit may be estimated by adding 5 c.c. of the spirit, drop by drop, to 30 g. of Pl₂ in a flask provided with an inverted condenser. The flask is then heated for 5 minutes in boiling water, and the MeI then distilled off by inclining the condenser. The volume of MeI is read off in a graduated receiver 5 c.c. of methyl alcohol yield 7-19 c.c. of methyl iodide (Krell, *B.* 6, 1810; cf. Grodzki a. Kramér, *B.* 7, 1495; 9, 1928). If it is desired to determine how much of the methyl alcohol is in the form of MeI₂, the spirit may be boiled with standard acid, and the amount used up in the saponification determined.

Bardy and Bordet (*A. Ch.* [5] 16, 665) modify Krell’s process, using only 15 g. of Pl₂ to 5 c.c. of wood spirit, but adding 5 c.c. of aqueous HI subsequently. They distil the liquid at 80°-90°, and at the end of the distillation add 5 c.c. of water and quickly distil. The methyl iodide is washed once or twice with water and measured.

Di-methyl ortho-acetic aldehyde or methyl-acetal CH₂=CH(OH)₀, boils at 64° and gives MeI on treatment with Pl₂, but it does not react with aniline, so that when the wood-spirit is to be used in preparing di-methyl-aniline, by heating with aniline hydrochloride, the estimation by Pl₂ will give too high results.

The presence of acetone is objectionable in methyl alcohol that is used for preparing di-methyl-aniline. Its amount can be determined by shaking 1 or 2 c.c. of the alcohol with 20 or 30 c.c. of normal aqueous KOH, adding 20 or 30 c.c. of a decinormal solution of iodine, until the solution is clear. The liquid is then acidified with HCl (5.0-1.025), excess of decinormal sodium thiosulphate added, and the excess determined by titrating back with iodine solution. If 1 c.c. of methyl alcohol is taken, the weight of acetone in 100 c.c. will be found by multiplying the amount of iodine used up by 7012 (Mesinger, *B.* 21, 3366; cf. Kramér, *B.* 13, 1002; Hintz, *Fr.* 27, 182).

The estimation of methyl alcohol in ethyl alcohol can be effected by oxidation with a standard solution of K₂Cr₂O₇, for 1 pt. of ethyl alcohol reduces 4-275 pts. of the dichromate in

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<table>
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<td>+22-7</td>
<td>20-7</td>
</tr>
<tr>
<td>+30-2</td>
<td>20-7</td>
</tr>
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</table>

Vol. III.
spirits, decolourisation takes place at once (Habermann, Pr. 27, 620).—Reactions. — 1. Passage through a red-hot tube yields acetylene and other products (Berthelot, C. R. 50, 805).—2. In contact with platinum-black and air it is oxidised to formic aldehyde and formic acid. —3. Heated with ammonium chloride in a sealed tube at 300° it yields methyl cyanide and ethyl cyanide (Berthelot).—4. Bleaching-powder does not yield chloroform (Goldberg, J. pr. 24, 116). — 5. Potassium gives off hydrogen, forming KOH. — 6. When its vapour is passed over heated potash, hydrogen is given off, and potassium formate, oxalate, and carbonate are successively formed. — 7. Conc. HSO₃ forms HMeSO₃, which, when heated with excess of methyl alcohol, yields dimethyl oxide. When distilled with excess of H₂SO₄ di-methyl sulphate passes over. — 8. Converted into methyl chloride by treatment with HCl, with PCl₅, or with SO₂. The joint action of H₂SO₄ and HBr gives rise to methyl bromide and ethyl bromide (Niemelovitch, M. 10, 820). — 9. SOCl₃ forms MeSH, Me₂SO₃, MeCl, and other products (Carius, A. 111, 93). — 10. SO₂ forms CH(OH)SO₂H₂ (Max Müller, B. 6, 1931). — 11. When acidulated with 5 p.c. sulphuric acid and submitted to electrolysis it forms CO₂, CO₂, methylene formate, methyl sulphate, and methylvl (Renard, C. R. 80, 236). — 12. Distillation over heated zinc dust splits it up into CO and hydrogen, a very little methane being also formed (Jahn, B. 18, 893; M. 1, 378). — 13. Zinc chloride forms CH₂, water, MeO₂, hexa-methylene-benzene, and traces of propylene, butylene, and other hydrocarbons (Le Bel a. Greene, C. R. 87, 260; 89, 413). — 14. Aldehyde (1 vol.), MeOH (2 vols.), and HCl form CH,O(OMe)₂ (Claus a. Trainer, B. 19, 3044). — 15. Not affected by B. acetii growing in solutions containing it (Brown, C. J. 49, 1373). — 16. Converts and dioxo-benzoic acid into C₃H₅(OMe)₂CO₂H, while dioxo-benzoic acid only gives benzoic acid (Gries, B. 21, 978). — 17. When heated with hydrochlorides of aromatic bases (e.g. aniline, xyline, piperidine) it often displaces hydrogen in the nucleus by methyl (Kofmann, Z. 16, 2936; Ladenburg, B. 15, 2927). — 18. Until b.p. it is pyridine when heated with phenol and ZnCl₂ (Außer, J. 17, 669). — 19. Unlike butyl and amyl alcohols, it does not form a homologue of benzene when heated with benzole and ZnCl₂ at 270° (Goldschmidt, B. 15, 1086). — 20. COONH₄ forms methyl aliphathnate NH₂CO₂HCO₂Mg [298°] (Gattermann, A. 244, 40). — Metallic derivatives. — KOH. Obtained by dissolving K in methyl alcohol. (KOH)(MeOH)₃ or (KOMe₂)(MeOH)₃aq. [c. 110°]. Obtained by evaporating a solution of KOH in methyl alcohol (Göttig, B. 21, 1283). Larger crystals plate somewhat heavier than water, on which they move about rapidly being decomposed. — (NaOH)(MeOH)₃ or (NaOMe)₃MeOH aq. Obtained by dissolving NaOH in dry MeOH and evaporating. Crystalline mass, which moves about on the surface of water, decomposing and dissolving. — NaOMe aq. Obtained by evaporating a solution of NaOH in not quite dry methyl alcohol (Göttig, B. 21, 501). — NaOMe(OMe)₂ (Fröhlich, A. 202, 295). CO passed over NaOMe at 160° forms acetic acid. CO passed into a hot mixture of NaOMe and NaOAc forms propionic acid (Geuter a. Fröhlich, A. 202, 319). When distilled with the Ba salt of a carboxylic acid it displaces the carboxyl by hydrogen. Thus succinic acid may be converted into propionic acid (Mai, B. 22, 2135). — TIOMe. From TiO₂ and excess of Me₄O (Lamy, J. 804, 466), (BaOMe)₂Ba₂H₄aq. While numerous plaques are obtained by evaporating at 138° a solution of BaO in MeOH (De Forcané, C. R. 102, 1597, 1557). Perhaps identical with BaO(OMe)₂aq described by Dumas and Péligot (A. Ch. 68, 17). 1 litre of MeOH dissolves 200 g. of BaO. The heat of formation of the compound from solid BaO and liquid 4MeOH is 69,500. If a considerable quantity of water is added to the solution of BaO in MeOH the hydrate BaO·10aq is precipitated. The compound Ba₂O₃(OMe)₂aq is readily formed, even if as much as 3 p.c. water be present in the methyl alcohol, but by evaporating in the cold over H₂SO₄, crystals of BaO(OMe)₂aq are formed. These are sol. water and alcohol. By passing HCl into a solution of baryta in methyl alcohol there is formed barium cyanomethylene Ba(OMe)CNMeOH. This is a crystalline powder, sol. water, less sol. methyl alcohol. It loses at 105° the methyl alcohol of crystallisation. — Combinations. — CaCl₂, 4MeOH. Methyl alcohol dissolves CaCl₂ with great rise of temperature, and on cooling this compound separates in large six-sided tablets (Kane, A. 19, 168). It is not decomposed at 100°, but water readily liberates the MeOH. — Li₂33MeOH. — MgCl₂·6MeOH (Simon, J. pr. 20, 377). — SnCl₄·MeOH. [81°]. Slightly yellow crystals (from hot alcohol); decomposes at 136°, giving off MeCl and HiCl (W. C. Williams, C. J. 50, 463). — CuSO₄·2MeOH. Minute bluish-green crystals, obtained by shaking anhydrous CuSO₄ with methyl alcohol (Forcrand, C. R. 102, 561). — Methylaldehyde is formic aldehyde. — Methyl-alizarin v. Di-oxy-methylanthracenone. — Methyl-allantoin C₉H₈N₂O₃. [225°]. Formed by oxidising methyl-uric acid with cold aqueous KMO₃. It forms white prisms; decomposes by fusion; V. sol. hot water, sol. sol. alcohol, insol. ether. Conc. HI₄aq splits it up into urea and methyl-hydantoin. — Ag₂C₈H₄N₂O₃; prisms, sol. cold water. — Methyl-allpan C₆H₅N₂O₃, i.s. CO<=>NH, CO<=>CO. Formed by oxidizing methyl-uric acid with HNO₃ or with KCIO₄ and HCl (Hiill, B. 9, 1092). Formed also by treating thecrobene (2 pts.) with KCIO₄ (9 pts.) and HCl (4G. 106) at 50° (May a. Andreaess, M. 3, 108; cf. Fischer, A. 215, 304). It is converted by alkalis into methyl-alloxan and by boiling HNO₃ into methyl-parabanic acid. H₂S forms di-methyl-alloxalin. KIHSO₃ forms a compound KH₂SO₃aq, which crystallises in large monoclinic prisms. — Di-methyl-alloxan C₉H₈N₂O₃, i.s. CO<=>NMe₂CO<=>CO. A product of the action of KCIO₄ and HCl on caffeine at 50°. It is extracted by ether (E. Fischer, A. 215, 257; May a. Andreaess, M. 8, 92). Colourless six-sided
METHYL-AMIDO-ACETIO ACID.

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METHYL-ALLYL-CHLORACETOL v. DI-CHLORO-HEXENE.

METHYL ALKYL ETHER v. METHYL ALKYL OXIDE.

METHYL ALKYL DIKETONE CH₃O H₂ i.e. CH₃.CO.CO.C.H₃ Acetyl-crotonyl (c. 130°)

Obtained by distilling its mono-oxime with dilute H₂SO₃ (Otte a. Von Pechmann, B. 23, 2124).

Yellow oil with irritating odour. Not obtained pure.


[46°]. From allyl-aceto-acetic acid and nitrous acid. White plates (from ligroin), v. sol. usual menstrua. Its solution in NaOHaq is yellow.


METHYL-ALLYL-PROPYL-CARBINOL v. OCTANOL-ALCOHOL.

METHYL ALKYL SULPHIDE CH₃S i.e. CH₃.S.C.H₃ (c. 92°). V.D. 43-36. Formed by heating lead methyl mercaptide (CH₃S)ₙ with allyl bromide and ether at 100° (Obermeyer, B. 20, 2935).

METHYL ALKYL THIO-UREA

CH₃.NH.CS.NH.C.H₃ (50-5°). Formed from allylamine and methyl thio-carbinide or from methylyamine and allyl thio-carbinide (O. Hecht, B. 23, 286). White mass.

METHYL-AMIDO-ACETIC ACID CH₃N₂O₄ i.e. CH₃.NH.C.CO₃ Hydroxyamine. Sarcosine. Mol. w. 89. [210°-215°]. Formed by the action of boiling baryta-water on creatine or caffeine (Liebig, A. 62, 310; Rosengarten a. Strecker, A. 157, 1; Schilling, C. C. 1884, 411). Formed also by heating chloroacetooxyther with aqueous methylamine at 125° (Volhard, A. 123, 261).

Properties.—Triclinic prisms, v. e. sol. water, sl. sol. alcohol. Has a somewhat sweet taste. Heated to 210°-220° the greater part evolves H₂O giving the anhydride NH₂N₂O₄ whilst a smaller portion splits up into di-methyl-amino and CO₂ (Mylius, B. 17, 268). Chlorides of cyanogen passed into the fused substance gives methyl-hydantoin and sarcosine anhydride (Traube, B. 15, 2110). When taken internally, the greater part passes as such into the urine (Barman a. Meing, B. 8, 557; Salkowski, H. 4017, Schiller, H. 5, 266). Nitrous acid passed into its aqueous solution forms a nitroso-derivative CH₃.N(NO₃).CH₃.CO₃.H which is a thick liquid, forming the salt Ca₃.NO₄ crystallising in needles (Schultzen, Z. 1867, 616). Gives methyl-uric acid when heated with urea (Horbaczewski, M. 6, 356).


Tables (containing 2aq), which slowly turn red in air. V. e. sol. water, almost insol. alcohol, insol. ether. Dyed the skin red. With Fe₂S₄ and ammonia it gives a characteristic indigo colouration. After drying over H₂SO₃ it is left as an amorphous powder (containing aq), sol. alcohol and ether. Di-methyl-alloxan decomposes at 100°. It prevents the ppm. of cupric and ferro salts by heat. Hydrogen sulphide converts it into amalac acid. KHSO₄ forms the compound C₂H₅.N₂O₄.KHSO₄ which crystallises in long tablets, S. 7·2 at 90°, almost insol. alcohol, insol. ether. This compound may be crystallised from warm water, and does not give the indigo colouration with Fe₂S₄ and ammonia.

METHYL-ALLOXANTIN ACID C₂H₅.N₂O₄. Formed by the action of alkalis on methyl-alloxan. When the product of the action of HNO₃ on methyl-uric acid is neutralised with CaCO₃ and then mixed with alcohol and ammonia the salt CaC₂H₅.N₂O₄ is ppd. (Hill, B. 3, 1009). This salt is glosous, and when boiled with water it gives a black residue with a strong odour (Andreasen, M. 3, 431). Crystallises from water in minute thin tablets (containing aq).


Di-methyl-alloxantin CO₂-NMe₂.CO C(OH)₂.C(OH)₂.CO₂-NMe₂.CO Formed by reducing di-methyl-alloxan to dimethyl-dialdoxalic acid, and preg. the aqueous solution of this acid with alloxan (Andreasen, M. 3, 438). Crystallises from hot water in minute four-sided pyramids (containing aq); insol. alcohol and ether.

Tetra-methyl-alloxantin v. AMALO ACID.

METHYL-ALLYL v. BUTYLENE.

METHYL-ALLYL-ACETO-ACETIC ACID v. ACETO-ACETIC ACID.

DI-METHYL-ALLYL-AMINE. Methylo-tadiga C₃H₇.NMe₂. From allylamino and Mol (Bonde, B. 20, Ref. 187). When distilled with KOH it yields NMe₂ and an aldehyde C₂H₅.O (180°-185°).

METHYL-ALLYL-BENZENE C₆H₅.H₂ i.e. CH₃.C.H₃.C.H₃.C.H₃. Allyl-toluene. (192°). Formed from cymene by chlorinating and heating the result with C₂H₅.Cl with alcohol KOH (Errera, G. 14, 268, 508). Liquid. Combines with bromine. KMnO₄ oxidises it to p-tolusch acid. HBrAg (S.G. 1·69) at 200° forms a polymeric (C₆H₅.H₂)₃ (30°), and this on keeping changes to an amorphous solid, which by distillation is re-converted into p-methyl-allyl-benzene.

METHYL-ALLYL-CARBINOL v. OCTANOL-ALCOHOL.

Di-methyl-allyl-carbinol v. HEXANOL-ALCOHOL.
METHYL-AMIDO-ACETIC ACID.

1867, 485. (CH₃NO₂)₂H₂P(Cl₂)₂ag: monochloroacetic acid, 2HCl: yellow needles, sol. cold water. C₄H₇NO₂H₂NCl: yellow needles, sol. cold water. C₅H₆NO₂H₂NCl₂: yellow needles, sol. cold water. C₆H₇NO₂H₂NCl₃: yellow needles, sol. cold water.

2. Guanidine hydrochloride. C₄H₄NO₂HClCH₄N₂. Formed by heating methyl-amido-acetic acid with guanidine hydrochloride (Baumann, B. 7, 1151). Tables (from alcolhol).

Anhydride C₄H₇NO₂ i.e. CH₃NC₄H₇CO

\[ \text{Sarcosine anhydride.} \]


Sodium salts. B₄H₄Cl₂P(Cl₃)₂ag: prisms. B₄H₄Cl₂P(Cl₃)₂aq: large six-sided table.

Sodium-sarcosine-uric acid C₂H₇NO₂. Obtained by heating a mixture of sarcosine (3 pts.) and uric acid (2 pts.) at 210°: a good yield is obtained.

Properties. Colourless prismatic crystals (containing 2H₂O). Sol. hot water. It shows the murexide reaction. It slowly reduces alkali solns. of copper. It has weak acid and basic properties, dissolving in aqueous acids and alkalis. By fusion with KOH at 110° it is resolved into uric acid and sarcosine. Heated with bromine water it is converted into bromo-sarcosine-urea C₄H₇NO₂Br.

Sodium salts. The acetate forms microscopic crystals, sal. sol. hot acetic acid, insol. cold H₂O, v. sol. water. The formate is very analogous to the acetate. The ammonium salt is crystalline.-A"Ag₂; insol. white amorphous mp. (Mylius, B. 17, 518).

Bromo-sarcosine-urea acid C₂H₇NO₂Br. Formed by digesting a warm aqueous solution of sarcosine-uric acid with bromine, which gives a nearly theoretical yield (Mylius, B. 17, 521).

Heavy colourless tablets. Sol. sl. water. By H₂S it is reduced to sarcosine-urea acid. It is readily decomposed by alkalis, but is stable towards acids.

Sodium-sarcosine-urea acid C₂H₇NO₂. Obtained by reducing a hot aqueous solution of bromo-sarcosine-urea acid with H₂S (Mylius, B. 17, 524). Tricrystaless or needles. V. sol. water, insol. alcohol. It is a strong acid, but also possesses weak basic properties. By bromine water it is recovered into the bromo-derivative; similarly chlorine-water gives the chloro-derivative, reducing AuCl₄ to alkaline, copper solution, KMnO₄, &c., very readily.

Salts. The acetate forms an unstable crystalline mp, sal. sol. acetic acid,-A"NO₂H; fine needles, v. sol. water.-A"Ag₂: white amorphous mp.

Tri-methyl-amido-acetic acid internal anhydride C₂H₃NO₂. Dihydrate.

DI-METHYL-AMIDO-ACETIC ORTHALDEHYDE. Methyl-hydroxide C₂H₇NO₂ i.e. CH₃(NMe₂)OH.CH(OH). Muscarine. Occurs, together with neurine, in the fly agaric (Schmiedeberg a. Koppe, J. 1876, 478). Formed from neurine by oxidation with conc. HNO₃ (Schmiedeberg a. Harnack, J. 1876, 804). Deliquescent crystalline mass, sol. alcohol. Alkaline in reaction. Active narcotic poison. Separated from neurine by placing the mixed hydrochlorides on filter-paper, when the muscarine salt deliquesces and is absorbed by the paper (Harnack, J. 1876, 803). B₄H₄Cl₂P(Cl₂)₂ag: C₂H₇NO₂AlCl₃.

Di-ethyl derivative of the methyl-hydroxide C₂H₇NO₂ i.e. CII₃(NMe₂)OH.CH(OH)_4. Hydroxide of trimethyl-amido-acetal. When chloro-acetal CH₂CL.CH(O(H))₂ is treated with tri-methyl-amine there is formed CII₃(NMe₂)CH(OH)₂, and C₂H₇NOCl, which is probably CH₃(NMe₂)CH(OH)thropic as CH₂Cl(NMe₂)Cl.CH(OH). The two salts are separated from the fractional parts by means of an isomeric salt (C₂H₇NO₂Cl₃)₄P₂: orange crystals, sal. sol. cold water. C₂H₇NO₂AlCl₃: lemon-yellow needles.

Di-methyl-amido-acetic aldehyde. Methyl-hydroxide C₂H₇NO₂ i.e. CH₃(NMe₂)OH.CH(OH). Formed by saponification CH₃(NMe₂)OH.CH(OH)₂ with baryta. It boils at 114° (Baumann, B. 7, 1149). The hydrochloride C₂H₇NOCl is also formed as above. The aldehyde reactions. Platinocloride (C₂H₇NOCl)P₂: octahedra (from dilute alcohol).


c-DIMETHYL-AMIDO-ANISOL v. c-DIMETHYL-AMIDO-FENOL methyl ether.

METHYL-AMIDO-azo. COMPOUNDS v. Azo.

METHYL-AMIDO-BENZAMIDE v. Amide of methyl-amido-benzonitric acid.

METHYL-AMIDO-BENZENE v. METHYL-ANILINE AND TOLUENE.

Di- methyl-amido-benzene v. XTHIDINE, METHYL-TOLUENE, and DI-METHYL-ANILINE.

Tri-methyl-amido-benzene v. Mesitylene and 4-CRESIDINE.

Tetra- methyl-amido-benzene v. Tetra-methyl-phenylamine.

Tetra-methyl-di-amido-benzene v. Tetra-methyl-phenylene diamine.


Acetyl derivative C₂H₇(NMe₂)₂(NH₂)(NH₂). [189°]. Prisms (containing ag) (Wurster a. Sendtner, B. 12, 1805).
METHYL-AMIDO-BENZOIC ACID. 261

\[ \text{Methyl-amido-benzoic acid} \]


**Di-nitrostilbene** [184°]. Leaflets.

**METHYL-AMIDO-BENZENES.** Azo-compounds of Azo-compounds and Disazo-compounds.

**DI-METHYLAMIDO-BENZENE PHOSPHINE.** NMe\(_2\)-C\(_6\)H\(_4\)-P(OH)\(_2\) [163°]. Formed by decomposing its chlorides with water (Schenk a. Michaelis, B. 21, 1498). White needles; v. sol. hot water and alcohol. On boiling its aqueous solution it is split up into dimethyl-aniline and phosphoric acid. When heated alone it gives phosphorus, I\(_2\), and di-methyl-aniline.

Salt.——NaH\(_2\)a\(_2\)aq: large crystals (from alcohol).

**Chloride** NMe\(_2\)-C\(_6\)H\(_4\)-P(OCl)\(_2\) [66°]. [290°]. 132°]. Formed by the action of PCl\(_3\) on di-methyl-aniline (70 g.) in presence of AlCl\(_3\). The mixture is boiled for eight hours with inverted condenser and the product extracted with petroleum ether and distilled in vacuo. Thin plates; v. sol. benzene, m. sol. ether, sl. sol. petroleum ether. Placed over the chlоро-benzene and sodium into di-methylamido-tri-phenyl-phosphine.

**DI-METHYLAMIDO-BENZENE PHOSPHONIC ACID.** NMe\(_2\)-C\(_6\)H\(_4\)-PO(OH)\(_2\) [133°]. Formed by oxidising NMe\(_2\)-C\(_6\)H\(_4\)-PO(OH)\(_2\) with HgCl\(_2\) (Schenk a. Michaelis, B. 21, 1600). Crystals; v. e. sol. water and alcohol.

**METHYL-AMIDO-BENZENE SULPHONIC ACID** C\(_6\)H\(_4\)-N\(_2\)-SO\(_3\)H i.e. NMe\(_2\)-C\(_6\)H\(_4\)-SO\(_3\)H. Formed, together with methanesulphonic acid, by heating the acetyl derivative of methyl-aniline with H\(_2\)SO\(_4\) at 145° (Smyth, B. 7, 1249). Crystals, which decompose at 182° without previous fusion.

—Baa\(_2\)aq: crystalline powder.


**Properties.** —8-sided prisms (containing aq.). Decomposes at 320°.


**Chloride** C\(_6\)H\(_4\)(NMe\(_2\))SO\(_3\)Cl.

**Ethyl ether** Et\(_2\)a\(_2\) [85°]. Formed from alcohol and the chloride.

**Di-methyl-amido-benzena p-sulphonic acid.** Anhydroide of the methyl-hydroxide C\(_6\)H\(_4\)-N\(_2\)O\(_3\), i.e. C\(_6\)H\(_4\)O\(_2\)NMe\(_2\)O. Formed by allowing a mixture of amido-benzena p-sulphonic acid, MeI, conc. KOH, and MeOH to stand for some time in the cold (Griess, B. 12, 2116). Four-sided plates; v. sol. cold water, almost insol. alcohol, insol. ether. Decomposes before fusion. Ppd. as periodide by a solution of iodine in H\(_2\)O.—SO\(_4\)-H\(_2\)O-NMe\(_2\)-Cl, PtCl\(_2\) 8aq: orange plates, v. sol. cold water.


**Acetyl derivative** NHMe\(_2\)-C\(_6\)H\(_4\)-CO.NHAc. [155°]. Long needles; v. sol. hot alcohol, m. sol. benzene and ether. When heated above 155° it forms the anhydro-derivative C\(_6\)H\(_4\)-CO.NMe\(_2\)CMe [190°] which is an oxy-dimethyl-quinazolone.

**Nitroso-derivative of the amide** NO-NMe\(_2\)-C\(_6\)H\(_4\)-CONH\(_2\) [149°]. Pale yellow prisms (from hot alcohol) (Finger, J. pr. [2] 37, 431).

**Methyl-amido-benzoic acid** C\(_6\)H\(_4\)-N\(_2\)O\(_3\) i.e. NHMe\(_2\)-C\(_6\)H\(_4\)-CO.H. Formed by boiling (a)-benzenesulphate Nin\(_2\)O.CNiH.NMe\(_2\)-C\(_6\)H\(_4\)-CO.H with baryta-water (Griess, B. 8, 325). Nodular groups of plates; v. sol. hot water. Nitrous acid ppts. a nitroso-derivative. Salt.——C\(_6\)H\(_4\)-NOCl: six-sided plates.

**Di-methyl-amido-benzoic acid** C\(_6\)H\(_4\)-NO\(_3\) i.e. NMe\(_2\)-C\(_6\)H\(_4\)-CO.H. [151°]. Obtained by es-

**Methyl ether** NMe\(_2\)-C\(_6\)H\(_4\)-CO.Me. [210°] (unc.). Obtained by fusing the isomeric anhydroide of the methyl-hydroxide (v. infra) (Griess, B. 6, 587). Heavy yellowish oil, sol. acids.——C\(_6\)H\(_4\)-MeNO\(_2\)-H\(_2\)SO\(_4\) very small prisms, sl. sol. dilute sulphuric acid, v. sol. water.

——C\(_6\)H\(_4\)-MeNO\(_2\)-H\(_2\)Cl: spindleshaped laminae, v. sol. cold water.

**Anhydroide of the methyl-hydroxide** C\(_6\)H\(_4\)-N\(_2\)O\(_3\), i.e. C\(_6\)H\(_4\)-O\(_2\)NMe\(_2\)O. Benzoylamine.

Formed by allowing a mixture of m-amido-benzoic acid with MeOH (1 mol.), aqueous KOH (3 mol.), and MeI (3 mol.) to stand in the cold; the product, after freeing from MeOH by distillation, being saturated with HI, whereupon the iodide NMe\(_2\)-C\(_6\)H\(_4\)-CONH\(_2\)H is ppd. This iodide is then boiled with water and lead hydroxide (Griess). Small deliquescence needles (containing aq.), which give up their water of crystallisation at 105°. V. a. sol. cold alcohol, insol. ether. Tastes bitter and is neutral in reaction. Forms (NHMe\(_2\)Cl.C\(_6\)H\(_4\)-CO.H)PtCl\(_2\) 4aq. crystallising in large prisms, v. sol. hot water.

**Methyloiodide** NMe\(_2\)-C\(_6\)H\(_4\)-CO.H. Formed as above. Small short prisms (containing aq.); v. sol. cold water.

**Methylochloride** NMe\(_2\)Cl.C\(_6\)H\(_4\)-CO.H.
METHYL-AMIDO-BENZOIC ACID.


Di-methyl-p-amido-benzoic acid
NMe₂C₆H₄COH. [235°]. Formed by boiling its chloride with water. Prepared by boiling for three hours a mixture of p-amido-benzoic acid (1 mol.), MeI (2 mols.), and aqueous KOH (3 mols.) dissolved in methyl alcohol (Michler, B. 3, 400). Obtained also by heating tetra-methyl-di-amido-benzenophenone with soda-lime at 340°, extracting the product with hot water, and ppb. by acetic acid (E. Biasch, B. 22, 341). Short needles (from alcohol); sol. aqueous KOH and HClAg, insol. dilute acetic acid. Nitrous acid forms NMe₂C₆H₄(NO)CO₂H [224°]. The Ca salt forms yellowish plates.

Methyl ether NMe₂C₆H₄CO₂Me. [102°]. Silvery plates (from alcohol); v. sol. benzene, ether, and chloroform, m. sol. dilute alcohol. Nitrous acid forms NMe₂C₆H₄(NO)CO₂Me·aq [101°].

Chloride NMe₂C₆H₄COCl. Obtained by heating di-methyl-aniline with COCl₂ at 50° in a sealed tube (Michler). Crystalline.

Nitrite NMe₂C₆H₄CN. From di-methyl-p-phospho-diaminophenyl by Sandmayer's reaction (Ahrens, B. 20, 2958).

Anhydride of the methyl-hydroxide
C₆H₄NO₃ i.e. C₆H₄<COe>. [α 255°]. When p-amido-benzoic acid is mixed with MeI, KOH, and methyl alcohol, there is formed, even in the cold, di-methyl-p-amido-benzoic acid and the iodide NMe₂C₆H₄CO₂H which crystallises in short yellow plates [233°] (Michael a. Wing, Am. 7, 105). The corresponding anhydride crystallises from colourless plates (containing aq); v. sol. water. It loses its water of crystallisation at 100°. The periodic forms long dark prisms [290°]. The platinochloride (NMe₂ClO₂C₆H₄CO₂H).P₄Cl₆ forms large red prisms.

Tetra-methyl-di-amido-benzoic acid. Di-methyl-di-hydroxide
(HO.NMe₂)C₆H₄.CO₂H [1:3:5]. The iodide (HO.NMe₂)C₆H₄.CO₂H is formed when di-amido-benzoic acid (1 pt.) is mixed with MeI (6 pts.), methyl alcohol (10 pts.), and twice as much of a concentrated solution of KOH as is required to neutralise the acid. The mixture should stand for some time, being kept alkaline by further additions of potash. The alcohol is then distilled off, and the iodide ppt. by HClAg (Grieser, B. 7, 89). This iodide crystallises from hot water in six-sided tables or plates, v. sol. hot water. With moist Ag₂O it yields a caustic alkaline liquid which, on evaporation, leaves the hydroxide as a hygroscopic mass of soft white plates. It rapidly absorbs CO₂, and metallic oxides from their salts. The corresponding chloride (NMe₂Cl)C₆H₄.CO₂H 8aq. obtained by neutralising the hydroxide by HCl crystals in small six-sided plates, v. sol. water, al. sol. hot alcohol. The periodic forms brownish-yellow needles. The carbonate CO₃.NMe₂C₆H₄.CO₂H 8aq. obtained from the iodide and Ag₂CO₃ crystallises from water in very small soluble plates, having an alkaline reaction. The platinochloride (OINMe₂C₆H₄.CO₂H.P₄Cl₆).aq is a pp. composed of very small pale-yellow plates, usually grouped in stars.

Derivatives v. Chloro-methyl-amiido-benzoic acid.

DI-METHYL-p-AMIDO-BENZOIC ALDEHYDE, C₆H₄NO i.e. NMe₂C₆H₄CHO. [78°]. Formed, together with CHCl₃, by heating NMe₂C₆H₄.CH(OH).COCl with alcoholic KOH (Bössneck, B. 18, 1530; 19, 366). With di-methyl-aniline and hydrochloric acid it forms (NMe₂C₆H₄).CH₂. OMe; NMe₂C₆H₄.CH:NOH. [144°]. Yellowish-brown plates (Knöfler a. Bössneck, B. 20, 8195).

Phenylhydrazide NMe₂C₆H₄.CH:NNHPh. [148°]. Needles (from alcohol).

DI-METHYL-AMIDO-BENZOPHENONE
C₆H₄.CO₂H.NMe₂. Benzoic-dimethyl-aniline. Benzoyl-dimethyl-aniline. Benzoyl-phenyl-di-methyl-amine. [39°]. Formed by heating the methyl-iodide to 181°. Formed also by heating malachite green (NMe₂C₆H₄).OH.C₆H₄.CH with conc. HClAg at 180°. Colourless plates (from alcohol). Insol. water, al. sol. cold alcohol, v. e. sol. hot alcohol or ether. It is a feebie base, its solution in concentrated acids being ppt. by water.

Methyl-iodide C₆H₄.CO₂H.NMe₂. Large tables, al. sol. cold water. Formed by heating p-amido-benzenophenone with MeI at 100°. It decomposes at 181° (Dechmer a. Weiss, B. 14, 1860; A. 210, 270; 217, 257).


Tri-methyl-di-amido-benzenophenone
NMe₂C₆H₄.CO₂H.NMe₂. [156°]. Formed, together with di-methyl-aniline, by boiling penta-methyl-tri-amido-tri-phenyl-carbinol with HClAg (Wichelshaus, B. 19, 109)." Nodular groups of needles (from alcohol).

Tetra-methyl-di-amido-benzenophenone
NMe₂C₆H₄.CO₂H.NMe₂. [172°]. (above 300°) (Grabe, B. 20, 3302).

Formation.—1. By passing COCl₂ into di-methyl-aniline (Michler, B. 9, 716, 1900).—2. By boiling hexa-methyl-tri-amido-tri-phenol-carbinol with HClAg (Wichelshaus, B. 19, 109).—3. From CCl₄.SOCl₂ and di-methyl-aniline (Michler a. Moro, B. 12, 1168).

Preparation.—By boiling auramine with aqueous HCl till decolourised, and ppt. with NH₄.

Properties.—White plates (from dilute alcohol); insol. water, m. sol. alcohol, v. e. sol. warm benzene, v. al. ether.

Reactions.—1. Heating with ZnCl₂ and
DI-METHYL-AMIDO-BENZOPHENONE.

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The nitroso-derivative forms the following salts: B₂HCl₂, Obtained by passing HCl into a solution of the nitrosobenzene in benzene. — B₂H₂Cl₄, O.H. [101°]. — Orange needles (from alcohol). The nitrosobenzene also gives a phenylhydrazide C₆H₅N₃H₂O [148°] (B. Bischoff, B. 21, 2452; 22, 337). — 8. In presence of dehydrating agents, such as POCl₃ or AICl₅ it condenses with secondary and tertiary bases. Thus with di-methyl-anilino it yields "crystal violet" C₆H₅(NH)C₆H₄Cl₂(NMe₂).

Salt: B₂HCl₄; small radially-grouped prisms (from alcohol). Decomposed by water, with separation of the base (Fehrmann, B. 20, 2814). — B₂H₂Cl₄; yellow granules, insol. water, v. al. sol. alcohol. — Picate B₂H₂Cl₄(H₂O)Cl₂. [107°]. — Small, purple, radially-grouped prisms (from alcohol). — insol. cold, v. al. sol. hot, water, m. sol. alcohol.

Di-methyl-di-iodide B₂MeI₂. [105°]. Light yellow plates (from alcohol), v. al. sol. cold, v. sol. hot, water and alcohol. Split up at 150° into Mo and the base (Nathansohn a. Müller, B. 22, 1870).

Di-methyl-di-hydrazide B₂Me₂(OH). From the preceding and moist Ag₂O. Small yellow plates (from alcohol), quickly becoming dark and resinous (N. A. M.).

C₆H₄N>CH₃, CO₂H₃, NH₂; i.e. NH₃CH₂C₆H₄(NH₂)C₆H₄Cl₂ (239°); colourless crystals (Munichmeyer, B. 19, 1852; 20, 1552).

Phenyl-hydrazide C₆H₅N₂H₄, i.e. (NM₃OCl₂, CO₂H₄H₂H₂[NH₂]NO). [175°]. Needles (from benzene-alcohol); m. sol. warm alcohol, v. sol. ether. Coloured green by acid oxidising agents (Ziegler, B. 20, 1115). Conc. H₂SO₄ gives a dark red colouration.


Dilute HClaq readily converts it, even in the cold, into tetra-methyl-amido-thiocyanurate.

Reactions. — 1. Sodium-amalgam reduces it (in alcoholic solution) to leucouramine (C₆H₅NM₃Cl₂, CH₃NH₂ [135°]). This substance forms colourless crystals which when treated with HOAc yield an intense blue solution (Grebe, B. 20, 3265). — 2. H₂S in alcoholic solution at 60° forms tetra-methyl-di-amido-thiocyanurate [161°]. — 3. CS₂ also forms (NM₃OCl₂, CO₂H₄H₂H₂[S])CS together with thiocyanic acid (Fehrmann, B. 20, 2847).


Phenyl-imide (NM₃OCl₂, CO₂H₄H₂H₂[NH₂])Cl₄Ph. Formed by heating the hydrochloride of the imide (auramine) with aniline at 100° (F.). Small greyish-yellow radially grouped needles (from alcohol), decomposing at 60°. Insol. water and ether. — BHCl₄; reddish-crystalline mass, sol. water and alcohol. Its aqueous solution gradually decomposes, yielding aniline and tetra-methyl-di-amido-benzophenone. — B₂H₄P(OC₃)Cl₂ — B₂H₄(NH₃)OH.

p-Tolyli-mide (NM₃OCl₂, CO₂H₄H₂H₂[NH₂])C₆H₅Me. Resembles the phenyl-imide. — B₂H₄P(OC₃)Cl₂.

Ethylene-di-amide C₆H₅(NH₂)₃C₆H₅N₃C₆H₅. Formed by heating (Fehrmann, B. 20, 2855). Yellowish plates (from alcohol), insol. water, m. sol. warm alcohol. On treatment with HOAc or dilute HClaq it decomposes into ethylene-diamine and (NM₃OCl₂, CO₂H₄H₂H₂[NH₂])CO. In alcoholic solution it is decomposed by HI into ethylene-diamine and (NM₃OCl₂, CO₂H₄H₂H₂[NH₂])CS. — B₂H₄Cl₄; yellow needles. — B₂H₄P(OC₃)Cl₂; amorphous flakes, insol. water and ether, v. sol. warm alcohol. — B₂H₄(NH₃)OH: flakes, v. al. sol. water, v. sol. alcohol.

Tolylene-di-amide (NM₃OCl₂, CO₂H₄H₂H₂[NH₂])C₆H₅. Formed by heating the hydrochloride of the imide (auramine) with (1, 2, 4)-tolylene-diamine at 160°, and treating the product with ammonia. Small brown scales. In dilute acetic acid solution it gives cotton, mordanted with tannin, reddish-brown. Dilute HClaq regenerates the original ketone. — B₂H₄P(OC₃)Cl₂ — B₂H₄(NH₃)OH.


**METHYL-α-AMIDO-n-BUTYRIC ACID**

\[
\text{CH}_3\text{CH}_2\text{CH}(<\text{CO})\text{NMe}_2\text{CH}_2\text{CH}_3\text{SO}_3\text{H}
\]

*Formed by heating α-bromo-butyric acid with a concentrated solution of methylamine in sealed tubes at 100°.* The product is boiled with baryta to expel NH₃, the Ba exactly ppd. by H₂SO₄, and the residue by Ag₂SO₄ (Duvillier, A. Ch. [5] 90, 188; C. R. 93, 429). Glistening leaflets (from alcohol), subliming above 120° without fusion. V. e. sol. water, m. sol. hot alcohol, insol. ether. Has a sweet taste. Feebly acid in action. By the prolonged action (several months) of cyanamide (1 mol.) in concentrated and slightly ammonical solution it is converted into butyro-creatine

\[
\text{CH}_3\text{CH}_2\text{CH}(<\text{CO})\text{NH}<\text{N(CIH)}\text{C}=\text{NH}
\]

crystallises from alcohol in slender silky needles composed of small rectangular plates (Duvillier, C. R. 95, 466; Bl. [2] 83, 539).


**Di-Methyl-amido-butyric acid.** — H₂A₁H₂PtCl₂: orange; aq. formed at 0°. — HA₄H₂PtCl₂aq: transparent yellow prisms; sol. water, alcohol, and ether. — The nitrate and sulphate crystallize with difficulty in long needles. — Cu₂A₁: light-blue prisms; sol. alcohol.

**METHYL-AMIDO-CAPROIC ACID.** — Anhydride of the methyl-hydroxyde C₆H₄NO₂

\[
\text{CH}_3\text{CH}(<\text{CO})\text{NMe}_2
\]


**METHYL-AMIDO-CARBOXYIC ACID.**

METHYL - AMIDO - CHLORO- v. CHLOROMETHYLAMIDO-.

**METHYL-AMIDO-CYANURIC ACID.**

**METHYL-AMIDO-ETHANE SULPHONIC ACID**

\[
\text{CH}_3\text{C}_2\text{H}_4\text{NSO}_3\text{H}, \text{i.e. CH}_3\text{CH}_2\text{CH}_2\text{SO}_3\text{H}
\]

*Methylnaurine.* [242°].

Formation. — From methyl-thioglycollic acid and bromine-water (Gabriel, B. 22, 1148).

Preparation. — Silver chloro-ethane sulphonate is heated with 8 times its weight of a solution of methylamine, satu. at 0° for 2.5 hours at 120°. The product is boiled with baryta to expel excess of methylamine, freed from excess of baryta by H₂SO₄, and evaporated to crystallisation. The crystals are washed with alcohol and ether, and dried in water. The yield is 25 p.c. (B. Dittrich, J. pr. [2] 18, 68).


Reactions. — I. N₂O₅ forms isethionic acid, (HO)C₆H₄CH₂SO₃H. — 2. With cyanamide it combines to methyl-taurocysteine or methyl-guanido-ethane sulphonic acid.

**Di-methyl-amido-ethane sulphonic acid**

\[
\text{CH}_3\text{C}_2\text{H}_4\text{NSO}_3\text{H}
\]

*Formed by heating di-methylamine β-chloro-ethane sulphonate (20 g.) with aqueous glycol dimethyl ether (6 g.) at 160° for 10 hours (James, J. pr. [2] 31, 416; C. J. 47, 370). Large tables (from water); v. e. sol. water, insol. ether. Decomposes at 270°— 280° without fusion. Does not combine with HCl.

**Anhydride of the methyl-hydroxyde**

\[
\text{CH}_3\text{C}_2\text{H}_4\text{NSO}_3\text{H}
\]


**METHYL-AMIDO-ETHYL-AMINE.**

**METHYL-AMIDO-ETHYL-BENZENE.**

**METHYL-AMIDO-ETHYL-KETONE**

\[
\text{CH}_3\text{CO}_2\text{CH(NH}_3\text{)}\text{CH}_2
\]

*Perhaps formed by reducing methyl nitroso-ethyl ketone, but if so it quickly changes to α-tetra-METHYL-PTARMIC.*

**METHYL-AMIDO-FORMIC ACID.**

**METHYL-CARBAMIC ACID.**

**METHYL-α-AMIDO-n-HEXOIC ACID**

\[
\text{CH}_3\text{C}_2\text{H}_4\text{NSO}_3\text{H}, \text{i.e. CH}_3\text{CH}_2\text{CH}_2\text{CH}(<\text{CO})\text{NMe}_2\text{CH}_2\text{CH}_3\text{SO}_3\text{H}
\]

*Methylnaurine.* B. 109° at 110°. Formed by heating α-bromo-hexoic acid (1 mol.) with aqueous methylamine (2 or 3 mols.) at 100° for several hours (Duvillier, C. R. 90, 822; A. Ch. [5] 29, 165). Silky needles (from water) or pearly plates (from alcohol); v. e. sol. cold alcohol, insol. ether. Neutral in reaction. Volatilises above 100°. Does not reduce silver or mercuric nitrate. Gives with ferric chloride an intense red colouration and a yellowish-brown colour, and an equiv. quantity of cyanamide in cold concentrated solution containing a few drops of NH₃ forms in a few weeks crystals of \text{hexoic creatine} C₆H₄NO₂.

\[
\text{CH}_3\text{C}_2\text{H}_4\text{NSO}_3\text{H}
\]

Sl. sol.


HA’H₂PtCl₂: orange crystals; v. e. sol. water, v. sol. alcohol, v. sol. ether. — The aurochloride forms golden needles; the sulphate forms very indistinct crystals. — Cu₂A’2aq: blue scales, S. I.

Di-methyl-amido-hexoic acid. *Methylo- 

\[
\text{H}_2\text{O}_3\text{CH}(<\text{CO})\text{NMe}_2\text{C}_2\text{H}_4\text{CO}_2\text{H}
\]

*Formed by heating leucine (1 mol.) derived from casein with aqueous KOH (3 mols.), and Me₂SO₄ (8 mols.). The resulting INMe₂C₂H₄CO₂H crystallises from alcohol in needle-shaped crystals. Being decomposed by moist Ag₂O (Körner a. Menozzi, G. 18, 383). Strongly alkaline. Decomposes at 150°--180° into trimethylamine, an acid, CH₃O₂H, and ortho-hexoic acid. Forms the platinochloride
METHYL-AMIDO-MESTYLINE.

(CINMe₂CH₃CO₂H)P(Cl)₂aq. aurochloride Cl₂(NMe₂CH₃CO₂H) (165°), and periodide. The periodide forms lustrous green crystals, decomposed by H₂S, yielding INMe₂CH₃CO₂H (191°), crystallizing in small prisms.

DI-METHYL-AMIDO-HYDROQUINONE
C₆H₉(NMe₂)OH [2:4:1]. Di-methyl derivavative C₆H₉(NMe₂)(OMe)₂.

Methylo-iiodide B'MeI. [203°]. Formed by heating the dimethyl derivative of amido-hydroquinone with methyl iodide (Basser, B. 17, 2125). White needles; v. e. sol. water, al. sol. alcohol, nearly insol. benzene, chloroform, and ligroine.

Methylo-hydroxide B'MeOH: soluble needles.

Methylo-chloride B'MeCl: white easily soluble needles (172°)-B'MeCl(ClO₂): yellow crystals.-B'MeClClO₂:

TRI-METHYL-AMIDO-IMIDO-IMIDO-DIPHENYL SULPHIDE. Methylo-chloride C₆H₅N₂S(CI)Cl i.e. N₃C₆H₅(NMe₂)SO₃. Methyl-

NMe₂Cl

blue. Chloride of tetra-methyl-thionine.

Formation. — 1. By the action of H₂S on an acid solution of nitroso-di-methyl-aniline and oxidation of the resulting deny-methylene-blue. In this reaction di-methyl-p-phenylene-diamine is an intermediate product (Caro, E. P. 1877, 3751; Koch, B. 12, 593; Berth., A. 230, 137).—2. By dissolving nitroso-di-methyl-aniline in H₂SO₄ (S.G. 1.4), treating with sulphuric acid, and adding an excess of the resulting pyrrole-diamine. (Caro, E. P. 1877, 3751; Koch, B. 12, 593; Berth., A. 230, 137).—3. By oxidation of di-methyl-p-phenylene-diamine in presence of Na₂SO₃, and further oxidation of the resulting C₆H₅(NMe₂)(NH)₂SO₃H by chromic acid (Bayer, P. 1881, 495).—4. By reducing the compound C₆H₅(NMe₂)(NH)₂SO₃H₄ with an excess of the resulting "solvable green" C₆H₅(NMe₂)Cl or N₃C₆H₅(NMe₂)Cl, slowly changing in aqueous 

solution to methylene-blue (Berth., A. 251, 10).

Properties. — Minute dark-blue laminae (containing 3aq), v. e. sol. water and alcohol. Dyes mordanted cotton blue. As aqueous solution is blue and not affected by HCl or ammonia. NaOH gives a violet colour and, when added in large quantity, a dirty violet pp. Cona. H₂SO₄ gives a yellowish-green solution, becoming blue on dilution. The aqueous solution is decolourised by H₂S or Na₂SO₃; the colour is restored even by feebly oxidising agents. Sodium hyposulphite Na₂SO₃ reduces it to the leuco-base. Fuming HClaq at 25° or Cl₂ on a solution of H₂SO₄ yields the diazo-compound H₂SO₄ and HCl, which is precipitated by H₂S. Boiling dilute HNO₃ in N₂O₅ oxidises it, forming H₂SO₄, forming acetyl chloride Methyl-chloride C₆H₅N₂S(CI)Cl i.e. N₃C₆H₅(NMe₂)Cl, SO₃Cl²eq.

Salt. —(C₆H₅N₂S(CI)Cl)ZnCl₂aq.

Methylo-hydroxide N₃C₆H₅(NMe₂)Cl — S. N₃C₆H₅(NMe₂)OH — S. N₃C₆H₅(NMe₂)Cl. Formed by treating methylene-blue with moist Ag₂O. Amorphous, dark-blue mass; v. e. sol. water and alcohol, insol. ether.

Methylo-iiodide C₆H₅N₂S(NCI): brassy needles (from hot water). The di-chloro-derivative of this iodide C₆H₅Cl₂(NCI) is formed by successive treatment of di-chloro-di-methyl-phenylene-diamine C₆H₅Cl(NMe₂)(NHCl) with H₂SO₄, FeCl₃, and KI (Mohlau, B. 10, 1912).

TRI-METHYL-AMIDO-IMIDO-IMIDO-DIPHENYL-SULPHONIC. Methylo-iiodide C₆H₅N₂S(CI)Cl i.e. N₃C₆H₅(NMe₂)Cl. N₃C₆H₅Cl.

C₆H₅N₂S(CI)Cl.—N₃C₆H₅(NMe₂)Cl. Methyl-

N₃C₆H₅Cl

cr-Azure. Formed, together with methylene blue, by boiling methylene blue with Ag₂O and a large amount of water (Bernthan, A. 280, 175). Siender needles with green lustre, sol. water, forming a violet solution from which it is ppt. by KI. Alkalis destroy the colour of the solution. The corresponding C₆H₅N₂S₂Cl crystallises in needles, v. e. sol. water. It dyes silk like methylene blue.

TETRA-METHYL- DI-AMIDO-IMIDO-DIPHENYL METHANE. Methyl-ride of Tetra-methyl-di-amido-benzophenone.


Tetra-methyl-di-amido-imido-di-phenyl sulphide C₆H₅N₂S i.e. NH₃C₆H₅(NMe₂)ClS. Leuco-methylene blue. Formed by treating methylene-blue with sodium hyposulphite Na₂SO₃ (Bernthan, A. 280, 147). Needles (from alcohol), v. sol. water, m. sol. cold alcohol. Gives an acetyl derivative, v. sol. alcohol, ether, and benzene. With MoI it forms N₃C₆H₅(NMe₂)(NH₂)SO₃Cl, SO₃Cl²eq. crystallising in plates, v. e. sol. water and alcohol, insol. ether. Oxidised by air to methylene blue, B'B'H₂O₃ — B'B'H₂O₃ — B'B'H₂O₃. Prisms.

Di-methyl-amido-imido-phenyl disulphide Methyl-chloride C₆H₅N₂S(CI)Cl i.e. N₃C₆H₅(NMe₂)Cl — S. Methylene red. A by-product in the manufacture of methylene-blue from di-methyl-p-phenylene-diamine and H₂S followed by FeCl₃ (Berth., A. 280, 105; B. 12, 65). Small green glittering prisms (from alcohol), v. e. sol. water, insol. ether. As aqueous and alcoholic solutions are purple. Not affected by HCl. Alkalis decompose it.—Zinc salt (C₆H₅N₂S(CI)Cl)ZnCl₂aq.
METHYL-AMIDO-METHYL-BENZENES.

METHYL-AMIDO-METHYL-BENZENES v. METHYL-PHENYL-METHYL-AMINES.

DI-METHYL-AMIDO-METHYL-PHENAZINE

**AZINE C_{6}H_{4}(NMMe) \rightarrow C_{6}HMe**. Formed by elimination of the NH group from ‘tolylene-red’ by means of nitrous acid and alcohol (Barnes as Schütz, B. 19, 2605). Red greennish-glistering needles or flat prisms. Has basic properties. Dissolves in dilute acids with a violet colour, in conc. H_{2}SO_{4} with a reddish-brown, which on dilution first becomes green, then blue, and finally violet. Soluble in ether with a yellowish-red colour and yellow fluorescence. Sublimable.

Di-methyl-di-amido-methyl-phenazine

C_{6}H_{4}N_{4} \text{ i.e. } C_{6}H_{4}(NMMe) \rightarrow C_{6}HMe(NHMe).

Tolylene-red. Formed by oxidation of nitroso-amidino-dimethyl-aniline together with tolylene-diamine. The leuco-base has the formula C_{6}H_{4}(NMMe)NH \rightarrow C_{6}HMe(NHMe) (Barnes as Schütz, B. 19, 2604).

DI-METHYL-AMIDO-METHYL-QUINOLINE TETRAHYDRIDE. *Di-methyl-di-iodo* C_{6}H_{4}Me.NMe.NMeJ. [171°]. Formed by heating (Py.)-amidoquinoline tetrahydrde with methyl alcohol and Mel (Ziegler, B. 21, 802). Crystals.

**METHYL-AMIDO-METHYL-THIAZOLE**

S.O(NHMe) \rightarrow \text{N.} \text{Methyl-thiazylamine.} [42°]. Formed by the action of chloroaceton on methyl-thio-urea (Traum, A. 249, 44). Crystalline but extremely hygroscopic, m. sol. ether. Strongly alkaline in reaction. When heated with HClAg in a sealed tube it yields methylamine. Or completely decomposes it.

Salts.—B'HAg. [64°].—Platinocloride: orange-yellow plates [167°].

*Acetyl derivative* C_{6}H_{2}AcNH. [110°]. White needles.

**Methyl-amido-methyl-thiazole**

S.O(NH) \rightarrow \text{NMe.} \text{Imido-di-methyl-thiazole.}

CH=CMMe [47°]. Formed from chloro-acetone by treatment with ammonium sulfo-xyanide (Tcherniak a. Norton, B. 16, 845) and heating with Mel the resulting amido-methyl-thiazole (so-called propilin sulfoxyanide) (Hantsch a. Weber, B. 20, 8122, 3538). Crystalline, but very hygroscopic. Strongly alkaline. When heated with HClAg in sealed tubes it yields ammoxid. Conc. KOHAg has no action.

**Salts.—B'HClAg. Tables [104°].**—Platinocloride: orange tablets [108°].

*Acetyl derivative* C_{6}H_{2}AcO NMe. [113°]. White needles (containing 6 ag).

**Di-methyl-amido-methyl-thiazole**

C_{6}H_{4}N_{4}S \rightarrow \text{S.O(NMe)} \rightarrow \text{NMe. Methyl-imido-di-methyl-thiazole.} [96°]. Formed by adding conc. KOHAg to its hydro-iodide (Hantsch a. Weber, B. 20, 8122). White needles, sol. alcohol, water, and ether. Bromine ‘reacts with formation of C_{6}MeBr(NMe)SN [114°].

**Salts.—B'HIag. [64°].** From MeI and C_{6}MeH(NMMe)SN. Melts at 156° when anhydrous.

**Methyl-iodide** B'MeI. [85°]. White needles, v. e. sol. water and alcohol.

**DI-METHYL-AMIDO-NAPHTHOIC ACID**

C_{11}H_{13}(NMMe)(COII). [141°]. [165°]. Formed by heating di-methyl-(a)-naphtaline with COCl at 70° for 4 hours (Friedländer, B. 21, 8129).

Needles (from dilute alcohol), sol. dilute acida and alkalis. When acted upon by diazo-compounds the azo-group displaces the COII — (HNO)_{2}H.PCl_{5} : yellow needles.

**DI-METHYL-AMIDO-NAPHTHO-PHENAZINE**

C_{6}H_{4}N_{4} \rightarrow C_{6}H_{4}NMe. *Di-methyl-naphth-phosphorazine.* [205°]. Formed from nitroso-di-methyl-aniline hydrochloride, (8)-naphthylamine, and AcH (Witt, B. 21, 720).

Rhombic plates (from toluene or xylene), red by transmitted, and red or green, according to the faces, by reflected light; sol. alcohol, ether.

**METHYL-AMIDO-NAPHTHOQUINONE**

C_{6}H_{4}NO \rightarrow C_{6}H_{4}O(NMMe). [232°]. Formed by adding a solution of methylamine acetate to an alcoholic solution of (a)-naphthoquinone, evaporating nearly to dryness, adding water, and crystallising the pp. from alcohol (Phipton, C. J. 37, 639). Glittering red needles, v. sol. alcohol. Aqueous SO_{4} at 150° forms an unstable, colourless reduction-product.

**Di-methyl-amido-naphthoquinone**

C_{6}H_{4}O(NMMe). [118°]. From (e)-naphthoquinone and di-methyl-amine in alcoholic solution (Phipton). Red needles.

**DI-METHYL-AMIDO-NAPHTHYLAMINE v. NAPHTHYLEN-X-METHYL-DIAMINE.

**TETRA-METHYL-DI-AMIDO-DI-NAPHTHYL-PHENYL-METHANE**

Ph.CH(C_{6}H_{4}NMMe)_{2} \rightarrow \text{PhCH(C_{6}H_{4}NMMe)_{2}}. [189°]. Formed by the action of benzoic aldehyde on di-methyl-(a)-napthylyllamine in presence of ZnCl (Friedländer, B. 21, 8129).


**Rexa-methyl-tri-amido-di-napthyl-phenylmethane** HCl(C_{6}H_{4}NMMe)_{2}C_{6}H_{4}NMMe. [179°]. Formed by condensing di-methyl-p-amido-benzoic aldehyde with di-methyl-(a)-napthylyllamine in presence of ZnCl (Friedländer, B. 21, 8129). White needles. Does not yield a colour on oxidation.

**METHYL-AMIDO-NITRO- compounds v. NITRO-METHYL-AMIDO- compounds.

**METHYL-AMIDO-OXY- compounds v. OXY-METHYL-AMIDO- compounds.
TETRA-METHYL-DI-AMIDO-DI-PHENYL

METHYL-AMIDO-PERZONE v. METHYL-AMIDO-PFITTZERIANO ACID.


Methyl-hydroxyd CH11(OMe)O(OH) or CH11(OMe)(O)aq. Prepared by the action of MeI and KOH on a solution of o-amido-phenol in methyl alcohol (Griess, B. 13, 240). Prisms,

which become CH11(OMe)O at 105°. V. sol. water and alcohol, insol. ether. Has an intensely bitter taste. On distillation it is converted into CH11(OMe)(OMe)O with acids it forms the following salts: - CH11(OMe)(OMe)(O)aq: white soluble prisms. Its solution, neutralised by ammonia, deposits sparingly soluble needles or

prisms of CH11(OMe)(OMe)O(OH)CH11(OMe)O -.


Methyl-derivative CH11(OMe)O ni e. CH11(OMe)O et C,H11(OMe)(OMe) [1:2]. (211°). S.G. 21016. Formed by an isomer change by distilling O

CH11(OMe)O (Griess, B. 13, 246). Formed also from MeI and the methyl derivative of o-amido-phenol (Mühlhäuser, A. 287, 248). Colours liquid, with burning taste. - B,H3PtCl: sparingly soluble golden-yellow prisms.

Methyl-amido of the methyl derivative CH11(OMe)1OMe. From the preceding and MeI. Long white needles (O) or tables (M), sol. hot water and hot alcohol. With moist Ag2O it yields a strongly alkaline hydroxyd. It also yields a platinochloroide (CH11(NMe)OCl3), which crystallises in sparingly soluble yellow plates or tables.

Di-methyl-o-amido-phenol. CH11(OMe)OMe. Prepared by fusing di-methyl-amido-benzene m-sulphonic acid with KOH. Also by heating resin with di-methyl-amine under pressure.


Di-methyl-p-amido-phenol. Methyl-hydroxyd. The anhydride CH11(OMe)O is formed by the action of MeI and conc. KOHaq upon p-amido-phenol in the cold (Griess, B. 13, 250). Prisms or plates. Changes on distillation into the isomeric CH11(OMe)(OMe)O (48°).


TETRA-METHYL-p-DIAMIDO-DIPHENYL NM14, CH11(OMe)O, CH11(OMe)O. Tetra-methyl-benzidine. (195°) (above 300°).


Properties. - Colourless needles; sol. hot, sl. sol. cold, alcohol. Not volatile with steam. Gives a green colouration with FeCl3 or CrO3 - B,H3Cl7: sparingly soluble needles. - CH11(OMe)O: white needles. - CH11(OMe)O.


Tetra-methyl-tetra-amine-diphenyl NMe14, CH11(OMe)O, CH11(OMe)O, NMe14, Tetra-methyl-benzidine. (116°). Prepared by reduction of di-

Methyl-amido-phenyl-aceto acid C₈H₅NO₂ i.e. C₈H₅[CH₂O₂ + NH₂]CO₂H. Formed from the nitric acid of mandelic acid solution with sodium amalgam and water, and digested with alcoholic Na₂H₂O₇ at 70°, and decomposing the resulting nitrite with HCl (Tiemman a. Piest, B. 14, 1982). Slender needles (from hot water). Sublimes at 274°. Al. sol. cold water, insol. alcohol and ether. Amido C₈H₅.CH(NHMe),CO₂NH₂ [155°]. Slender needles. —B₂H₄Cl₂. Needles, sol. alcohol, insol. ether.


Nitrosonine C₈H₅(NO₂). [116°]. Yellow needles (from alcohol). Tetra-methyl-di-amido-diphenylamine (NMe₃C₂H₅,NH). [112°]. Obtained by oxidising a mixture of dimethyl-aniline (1 mol) and di-methyl-p-phenylene-diamine (1 mol) and reducing the resulting 'dimethyl-phenylene green' (Bindscheidler, B. 16, 864). Yellowish diimetric tables.

Hexa-methyl-tri-amido-triphenylamine. Trinethyl-trichloride (NMe₃Cl.CH₂.Cl).N. Obtained by heating tri-amido-diphenyl-amine hydrochloride with MeOH at 190° (Heyrich, B. 19, 758). White needles. (NMe₃Cl.CH₂.Cl).N SPICl₃.


Nitrosamine NMe₃C₂H₅,N(NO₂).CH₂.PH. [120°]. Slender yellow needles, sol. alcohol.


Nitrosine NMe₃C₂H₅,N(NO₂).CH₂.PH. [120°]. Slender yellow needles, sol. alcohol.


Tetra-methyl-di-amido-di-phenyl-carbinol C₂H₅.N(NO₂)₂.i.e. (NMe₃C₂H₅)₂.CH(OH). [96°]. Obtained by reducing tetra-methyl-di-amido-benzophenone in hot alcoholic solution with sodium-amalgam (Michler a. Duperrin, B. 9, 1899; Nathansohn a. Muller, B. 22, 1879). Colourless triclinic prisms, v. sol. alcohol, HOAc, benzene, and ether. Its solution in HOAc is blue, the benzene solution is colourless.

Salts. —B₂H₄Cl₂. Formed by passing HCl into a solution of the base in ether. Small colourless acleander radially grouped needles. In air it turns blue and deliquesces. It is dissociated by water.—B₂H₄PtCl₂: minute yellow needles, v. sol. hot alcohol.—B₂O₅.CH₃(NO₂)_₃.OH: dark-green crystalline mass, v. sol. hot alcohol, al. sol. benzene, insol. ether.


Preparation. —1. From di-methyl-aniline (3 mol.), ZnCl₂ (half its weight), and benzene-trichloride at 130°. The product is distilled with steam and the dye ppd. from the aqueous residue by NaCl. The pp. is the zinc double chloride, which may be converted by KOH into the base. This is converted into the oxalate which may be purified by crystallisation from water and then decomposed by ammonia (Doebner, B. 11, 1238; 13, 2222).—2. By the oxidation of a slightly acidic solution of tetra-methyl-di-amido-tri-phenyl-methane with MnO₄ or PbO₂ (E. a. O. Fischer, B. 12, 700), or with tetra-chloro-quinone (O. Fischer, A. 206, 130).—3. By heating di-methyl-aniline (4 pts.) with BzCl (2 pts.) and ZnCl₂ (5 pts.) (Fischer).

Properties. —1. Nearly colourless cubes. Insol. water. V. sol. alcohol forming a green solution. When freshly ppd. it is v. sol. ether, but when crystalline it is al. sol. ether; m. sol. OSₐ acetone, benzene or light petroleum.


Salts. —The salts of organic acids and
neutral salts of mineral acids are green and dye emerald-green. They are v. sol. water, the oxalate being m. sol. water and the picrate s. sol. water. Concentrated mineral acids turn the solutions orange, fording acid salts. Diluting with water restores the green colour. In the cold, dilute acids dissolve the base, forming a nearly colourless solution, which turns yellow deep green when heated, a molecule of water being probably split off. Thus the hydrochloride becomes C\(_2\)H\(_4\)N\(_2\)Cl\(_2\)SnCl\(_2\). Malachite green. Thick, dark-green prisms, sol. water (Fischer, B. 14, 2920), C\(_3\)H\(_7\)N\(_3\)Cl\(_2\)aq. C\(_6\)H\(_5\)N\(_3\)SO\(_4\)aq. C\(_3\)H\(_7\)N\(_3\)H\(_2\)SO\(_4\)aq: lustrous green prisms. (C\(_6\)H\(_5\)N\(_3\)Cl\(_2\)), \(\mathrm{C}_6\mathrm{H}_5\mathrm{C}_\text{C}_\text{C}_\text{C}_\text{N}_\text{Me}\). Malachite green. Large green tables, sol. water and alcohol. Picrates C\(_6\)H\(_5\)N\(_3\)C\(_6\)H\(_5\)H\(_2\)N\(_3\)SO\(_4\). Golden needles (from benzene), insol. water. C\(_6\)H\(_5\)N\(_3\)H\(_2\)SO\(_4\). Golden needles.

**Di-methyl-di-iodide** C\(_3\)H\(_7\)N\(_3\)I\(_2\). Formed by heating the base with MeI and MeOH at 100° (Debner). Green plates, s. sol. alcohol, ether, benzene, C\(_3\)I\(_2\), and cold water, v. sol. hot water. The same compound is obtained by heating di-p-amido-tri-phenyl-carbinol with MeI and alcohol at 120° (Debner, B. 16, 2926).

**Ethyl derivatives** C\(_3\)H\(_7\)C\(_\text{OEt}\)C\(_6\)H\(_5\)N\(_3\)Me\(_2\). From the base by heating with alcohol at 110° (O. Fischer, B. 12, 1866).

**Sulphonic acid** C\(_3\)H\(_7\)N\(_3\)H\(_2\)SO\(_4\). Green needles with reddish-brown lustre, v. sol. hot water, forming a green solution. — 
Mg\(_2\)C\(_6\)H\(_5\)N\(_3\)Cl\(_2\). — Ca\(_2\)C\(_6\)H\(_5\)N\(_3\)Cl\(_2\).


**Tetra-methyl-p-p-amido-tri-phenyl-carbinol** C\(_3\)H\(_7\)N\(_3\)C\(_6\)H\(_5\)N\(_3\)Me\(_2\). Oxidation of the acetyl derivative of the leuco-base (tetra-methyl-di-p-amido-0-amido-tri-phenyl-methane) with lead peroxide and dilute H\(_2\)SO\(_4\). (Fischer a. Schmidt, B. 17, 1892).

**Glistening prisms (from ether). The salts are soluble in water with a bluish-green colour.**

**Tetra-methyl-p-p-amido-tri-phenyl-carbinol** NH\(_2\)C\(_6\)H\(_5\)CH\(_2\)OH(NH\(_2\)C\(_6\)H\(_5\)N\(_3\)Me). Obtained by oxidising the acetyl derivative of tetra-methyl-p-amido-tri-phenyl-methane with PbO and boiling the resulting acetyl derivative with HCl (O. Fischer a. G. Körner, B. 18, 1804). Small crystals (from ether).

**Penta-methyl-tri-amiido-tri-phenyl-carbinol** C\(_3\)H\(_7\)N\(_3\)C\(_6\)H\(_5\)NMe\(_3\). Prepared by oxidising dimethylamine with SnCl\(_4\), with HCl, with KClO\(_3\), and KClO\(_4\), with KClO\(_3\) and CuSO\(_4\), or with NaCl and Cu(NOS)\(_2\). (Lauth, Rep. Chim. appl. 1881, 546; Poitiers a. Chappat, B. [2] 6, 502; Hofmann, B. 6, 297). Formed also by heating dimethylamine with C\(_6\)H\(_5\)SO\(_3\)Cl at 100° (Haacaneck, B. 12, 1275), and, together with formic aldehyde, by shaking hexa-methyl-tri-amido-tri-phenyl-carbinol with MnO\(_2\) and dilute H\(_2\)SO\(_4\). (E. o. Fischer, B. 11, 2007). Commercial methyl-violet may be freed from admixed hexa-methyl-tri-amiido-tri-phenyl-carbinol by boiling with ligroin (Wichelhaus, B. 18, 2006; 19, 105).

**Properties.** Brown powder, melting under water. Insol. water, ether, and ligroin. Its alcoholic solution is violet. Its solution in HCl is reddish-violet, and is pdp. by NaOH, but not by ammonia. Reduced by ammonium sulphide to its leuco-base. Tin and HCl reduce it, forming a substance melting at 165°. Boiling HCl melts it up into di-methyl-aniline and tri-methyl-di-amido-benzophenone.

**Salts.** Chloride C\(_3\)H\(_7\)N\(_3\)Cl i.e. (NMMe\(_3\), C\(_6\)H\(_5\)C\(_6\)H\(_5\)NMeCl. Amorphous mass, with green metallic lustre. Its aqueous solution is violet, but on adding HCl it becomes first green, then deep yellow-brown. It dissolves in alcohol. Conc. H\(_2\)SO\(_4\) forms a yellow solution, which on dilution changes through greenish-blue to violet. It dyes silk, wool, and mordanted cotton-violet. — C\(_3\)H\(_7\)N\(_3\)I. — minute needles.

**Picrate C\(_3\)H\(_7\)N\(_3\)H\(_2\)NO\(_3\)(OH).** Bronzed needles (from alcohol).

**Acetyl derivative.** Acetate (NMMe\(_3\), C\(_6\)H\(_5\)C\(_6\)H\(_5\)NMeAc. OAc. [2925°]. From methyl-violet, Ac.O, and NaOAc (O. Fischer a. G. Körner, B. 16, 2906).

**Hexa-methyl-tri-amiido-tri-phenyl-carbinol** C\(_3\)H\(_7\)N\(_3\)O i.e. (NMMe\(_3\), C\(_6\)H\(_5\)C\(_6\)H\(_5\)COH. Crystal violet. Hexa-methyl-para-rosaniline. [186°].

**Formation.** 1. Together with its methyl-iodide, by heating methyl-violet with MeI and MeOH at 120° (Hofmann, B. 6, 2933). — 2. By the action of dimethylamine on tetra-methyl-di-amido-benzophenone in presence of dehydrating agents (Kern a. Caro). In this reaction tetra-methyl-di-amido-thio-benzophenone may also be used. — 3. By the action of COCl\(_2\) of CICO\(_2\)Et, or of CICO\(_2\)CO\(_2\) in presence of ZnCl\(_2\) on di-methylamine. — 4. By condensation of tetra-methyl-di-amido-phenyl-carbinol with di-methylamine and oxidation of the resulting leuco-base. — 5. By gradually adding tetra-chloroquinine (1 pt.) to dimethylamine (2 pts.), and heating the product to 65° (Meister, Lucas, a. Brüning, B. 15, 212, 2100; Wichelhaus, B. 18, 2005). Perhaps the substance formed in this case is wholly or partially the penta-methyl compound. — 6. By the action of COCl\(_2\), or of CICO\(_2\)Et on dimethylamine in presence of AICl\(_3\) (Hofmann, B. 18, 767; Wichelhaus, B. 19, 109).


**Salts.** Chloride C\(_3\)H\(_7\)N\(_3\)Cl i.e. (NMMe\(_3\), C\(_6\)H\(_5\)COH). Hexagonal crystals, with greenish-brown lustre (Wada, B. 18, 766). Sol. alcohol. Forms a violet solution in water, which on adding HCl becomes first blue, then green, and finally yellow. NaOH gives a violet pp. Conc. H\(_2\)SO\(_4\) forms a yellow solution,

Methyl-iodide C, H, N, I, Me. From para-iodoaniline, Me, and MeOH at 115° (Hoffmann, B 6, 836).

TETRA-METHYL-DIAMIDO-DIPHENYL-CYMYLETHANE C, H, N, I, i.e., (NMg, CH, C, H, C, H,) Prepared by heating cuminic aldehyde with dimethylamine and ZnCl, to 120°; the yield is about 86%. On heating it gives a d-alcohol, resembling malachite green.

Salts. - B, H, Cl : white crystalline powder.


Hexa - methyl - tri - amido - phenylene - di - phenyl - diketone C, H, N, O, i.e., NMg, CH, (CO, CH, H,). [15°]. From boiling dimethylamine and COCl (Michler, B 9, 718; Michler a. Dupertuis, B 8, 1959). Monoclinic crystals; a = 587.1: 714; b = 125° 18'.

METHYL - AMIDO - PHENYL - ETHANE. Nitroso - derivative [4]; Et, C, H, NMg, NO. [129°]. Formed from di-methyl-amido-phenyl-ethane, HCl, and NaNMe (Heumann a. Wernick, B 20, 2423). Needles, insol. water, v. sol. ether, and cold alcohol. ZnCl, and HOAc reduce it to ethylphenyl-ethyl-hydrazine, the acetyl derivative of which melts at 68°.

Di-methyl-amido-phenyl-ethane [4]; Et, C, H, NMg, OH. [89°]. Formed, together with hexa-methyl-tri-amido-phenyl-methane, by heating glycol (1 mol.) with dimethylamine (2 mol.) and ZnCl, at 100°-120° (Il. a. W.). Needles or prisms (from alcohol), v. sol. ether, warm alcohol, and benzene, insol. water. Its salts are deliquescent, and its platinochloride is unstable. Oxidising agents colour it blue.

Methyl-iodide Et, C, H, NMg, I. From p-amido-phenyl-ethane and MeI (Hoffmann, B 7, 527).


Methyl-iodide C, H, N, Me. From di - amido-phenyl-ethane, MeI, and a little KOH at 160° (Heumann a. Wernick, B 20, 909).

Tetra-methyl-amido-tri-phenyl-ethane C, H, Me, (C, H, N, Me,). This is the chief product of the action of acetoephone on dimethylamylamine in presence of Zn(OH), (Doebner a. Petschoff, A 242, 839). Yellow oil, v. sol. ether, benzene, petroleum-ether, and hot alcohol. It boils above 360° with partial decomposition. It is not volatile with steam.


Deca-methyl - penta - amido - penta - phenyl - ethane C, H, C, H, Me, (184°). Formed by heating a mixture of dimethylamine (50 g.), chloral hydrate (20 g.), and ZnCl, (10 g.) at 100°; the yield being 10 g. (O. Fischer, B 11, 951; A 206, 120; Boesneck, B 18, 1916). Colourless needles (containing aq) (from alcohol), v. sol. chloroform. Sol. benzene, v. sol. alcohol and ether. On oxidation it gives a greenish-blue dyestuff.

DI-METHYL - a - AMIDO - DI-PHENYL-ETHYL ALCOHOL NMg, CH, PiH, OH (110°). From NH, CHPi, OH, Me, and EtOH (Goldschmidt a. Polowska, B 20, 494). White needles. - B, H, PiCl. [aq].


DI-METHYL-AMIDO-DI-PHENYL-METHANE.

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DI-METHYL-AMIDO-PHENYL-IMIDO-
QUINOLINE TETRACYCLIC HYDROXYL THIOSUL-
PHONIC ACID

C₈H₅N₂C₂H₅(NMe₅).S.SO₃H. Formed
by oxidising a mixture of quinoline tetrahydroxyl (1 mol.) with di-methyl-p-phenylene-diimino-thio-sulphonic acid (1 mol.) by K₂Cr₂O₇ (Lohmann a. Boye, B. 23, 1874). Small lustrous green needles, sol. sol. water. Changes after some time to a brown powder. Zinc-dust and HCl reduce it, and the product yields a blue dye on oxidation.

DI-METHYL-AMIDO-PHENYL HEXYL KE-
TONE C₆H₅NO i.e. NMe₂C₆H₅.COC₂H₅.HN. [492].
[100° at 20 mm.]. Formed, together with the leuco-base C₆H₅N₂H₂ by adding hexyl chloride to a mixture of ZnCl₂ and dimethylamine (Krafft, B. 19, 2987). [27] 147, 44]. Colourless needles. Gives with conc. HNO₃ a nitro-compound C₆H₅C₂H₅.COC₂H₅(NO).NMe₂. [65°].

O₂H₂ + NMe₂C₆H₅.C(OH)₂OH. H₂O. [997].
Colourless leaves.

DI-METHYL-AMIDO-DI-PHENYL-KE-
TONE C₆H₅NO i.e. NMe₂C₆H₅.COC₂H₅.HN. [28°].

Di-methyl-amiido-phenyl mercaptan C₆H₅.NS i.e. CH₅.N(NMe₂).HN(SH) [412].
[146]. Formed by reducing methylamine (Jacobson, B. 21, 2104; Berns, M. 251, 1). Gives a diazo-sulphide C₆H₅.NMe₂.(NMe₂络N [75°].

FeCl₃ gives a blue colouration. With AgCl in benzene it gives the hydrochlorides of ethyl-
amiido - dimethylamino - phenyl mercaptan


DI-METHYL-AMIDO-DI-PHENYL-
METHANE NMe₂C₆H₅.C₂H₅.NH₃. This is perhaps the base, boiling at 335°, produced by heating di-methyl-anilino benzylchloride in a sealed tube at 230° (Miehell, B. 10, 2079).

DI-methyl-amido-di-phenyl-methane

NMe₂C₆H₅.C₂H₅.C₂H₅.NH₃ [93]. Formed by boiling n-nitro-di-methyl-di-phenyl-carbinol with zinc-dust and HCl (Lippprech, B. 21, 3296). Colourless needles, coloured bluish-violet by PbO₂ or by tetra-chloro-quinone.

Tetra-methyl-di-amido-di-phenyl-methane

C₆H₅.NH₂ i.e. CH₅.OH.NMe₂. [91°].

Formation. - 1. By heating methyleno

iodide, CH₂I₃ or CHCl₃ with dimethylaniline (Hanhart, B. 12, 189; Doebner, B. 12, 810; cf. Hamann, B. 19, 1888). 2. By heating methyl CH₂(OCH₃)₃ (1 mol.) with dimethylaniline (2 mol.) in presence of ZnCl₂ to 120° (O. Fischer, B. 22, 1689; A. 206, 117); or by acting on a mixture of methyl and dimethylaniline with conc. HCl (Tröger, J. pr. [2] 36, 287). One of the products of the action of acetoephone with di-methyl-ketone on dimethylanilin in presence of ZnCl₂ (Doebner a. Fe-

schoff, A. 242, 888). - 4. By heating dimethyl-


benzophene (1 pt) with zinc-dust (10 pts) (Nathanassn a. Müller, B. 22, 1882). - 9. A pro-


amido-thio-benzophene with zinc-dust (Bühler, B. 20, 1373).

Properties. - Four-sided tables or glistening leaflets (alcohol). Insol. water, sol. cold, m. sol. hot, alcohol, v. sol. benzene, ether, and CS. Not volatile with steam. On oxidation with HOAc and MnO₂ it gives a fugitive blue colour. When boiled with MnO₂ and H₂SO₄ it yields quinomc. Its alcoholic solution is turned blue by boiling with tetra-chloro-

quinone. It may be oxidised to tetra-methyl-di-
amiido-benzophene (N a. M.). Cone. HNO₃ in HOAc forms a tetra-nitro-derivative which decomposes at 218°. With tri-nitro-benzene it forms a compound C₆H₅.NC₆H₅(NO)₃ [114°]. and with n-nitro-benzene a compound (C₆H₅.NC₆H₅(NO)₂) [74°] (Van Romburgh, B. T. C. 7, 226).

Salts - B₂H₅.Li : sparingly soluble salts.

B₂H₅.PtCl₃ : yellow precipitate. - Pervate.

B₂H₅.C₆H₅(NO)₂.OH. [75°].

Methyl-iodide B₂H₅.I. [214°]. Yellow


Tetra - methyl - exo - py - tri - amido-

phenyl - methane (NMe₂C₆H₅.CH.NH⁺) [182].

Obtained by reducing the imide of tetra-methyl-

di-amido-benzophene (auramin) with sodium-

amalgam (Grabe, B. 20, 2366). Colourless crystals; v. sol. water, m. sol. alcohol. Gives an intense blue colouration with HOAc.

Methyl-eco-amido-tri-phenyl-methane

C₆H₅.N i.e. (CH₅).ONHMe. [78°]. Obtained by passing methylamine into a hot solution of Ph₂CBr in benzene (Hemlin. a. Silberstein, B. 17, 745). Prisms (from ligroin). Insol. water, v. sol. alcohol.-B₂H₅.PtCl₃ 6aq.—B₂H₅.Pd. as lustrous blue-black needles by adding iodine to its solution in CS.

Di-methyl-eco-amido-tri-phenyl-methane

C₆H₅.N i.e. (CH₅).CNMe₂. [79°]. From eco-

bromo-tri-phenyl-methane and NMe₂ in benz-


NMe₂.C₂H₅.PtCl₃. 6aq. - Pd. as distinctive.


Formation. - 1. By heating di-phenyl-car-


Preparation. - Benzophene (10 g.), di-

methylaniline (18 g.) and zinc chloride (0.1 g.)
are heated in sealed tubes for ten hours to 190°. After distilling off excess of dimethylamine and benzophenone the residue is extracted with ether, and after distilling the last residue is recrystallized from alcohol (Doebner a. Petschow, "A. 242, 484").

Properties: Colourless needles; sl. sol. alcohol, v. sol. ether and benzene. Does not give a colouring matter on oxidation. Is a weak base, and does not combine with HOAc.

Salts. — B'HCl; — B'H2PbCl4: needles; sl. sol. hot water.

Methyl-iodide CnH3NMeI. [1867].

Large white plates.

Tetra-methyl-di-amido-tri-phenyl-methane CnH13NMe3. i.e. (NMe3)3C6H5CH2O. Leuco-base of malachite green. [102] and [94°].

Preparation. — 1. By heating a mixture of benzaldehyde (40 g.), dimethylamine (100 g.), and 93 p.c. alcohol (40 g.), in a water-bath, and POCl3 (65 g.) added slowly. The product is extracted with water, the filtrate ppd. by soda and the pp. recrystallized from alcohol (Nencik, M. 9, 1148).

Properties. — Crystallizes from benzene in large prismatic needles, melting at 102°, and from alcohol in triclinic needles, melting at 94° (E. a. O. Fischer, B. 12, 796). Insol. water, v. sol. ether and benzene, sl. sol. petroleum. In small quantities it can be distilled. Its salts are oxidised by MnO4 or PbO2 to malachite green. Nitric acid forms a hexa-nitro-derivative [200]. When distilled with zinc-dust it is reduced to aniline, dimethylamine, and p-nitro-di-phenyl-methane (Manns, C. C. 1888, 1363).

Salts. — B'HCl; colourless hygroscopic needles; v. sol. water. Gives off HCl at 100°, becoming B'HClO. — B'H2PbCl4: white pp., soon becoming yellowish-green. — The aurochloride is a golden-yellow flocculent pp.; Piorato B'2Cl2(N2O5)O(OH). [290]. Aggregates of needles; m. sol. water.

DI-mETHYL-di-IODIDE B'MeI. [218°—222°] (F). [331°] (Doebner, B. 18, 2229).

Plates, tables, or leaflets; v. sol. water. Decomposed on fusion into Me and the base.


Acetyl derivative CnH17NMe4. (NMe4)2(NHAc).

Glistening crystals. Gives on oxidation (NMe3)2C6H5.C(OH)2.NH. [65°]. Prepared by dissolving tetra-methyl-di-p-amiido-di-phenyl-carbonil (30 pta.) in HOAc (12 pta. of S.G. 1:18) and water (100 pta.), heating to 100°, and adding aniline hydrochloride (10 pta.) (Nathansohn a. Müller, B. 22, 1886). Small needles (from warm alcohol); v. sol. alcohol, ether, and benzene; insol. water. According to analogy it should be identical with the preceding body. With MeO it gives CH2(NMe4)H. [1727].


Benzoyl derivative (NMe3)2C6H5.C(OH)2.NHBz. [128°]. Small, slender blue plates (from warm alcohol); v. sol. hot alcohol and benzene, sl. sol. ether, insol. water.


Acetyl derivative [108°]. Needles. Yields on oxidation the corresponding carbinol, a splendid green dye (Fischer a. German, B. 16, 708).

Penta-methyl-tri-p-amido-tri-phenyl-methane CnH19NMe5. i.e. (NMe5)3C6H5.CH2O.C6H5.NMeH. [116°]. Obtained by heating penta-methyl-para-rosoniline with alcoholic ammonium sulphate at 100° (Hofmann, B. 6, 360; E. a. O. Fischer, B. 12, 799; Fischer a. Körner, B. 16, 2906). Large colourless needles (from alcohol). Sl. sol. hot water, v. sol. alcohol and ether. — B'H2PbCl4: Acetyl derivative [143°].

Hexa-methyl-tri-amido-tri-phenyl-methane CnH21NMe6. i.e. HOC(C6H5).NMe6. Hexa-methyl-pararosaniline. [178°].

Formation. — 1. By treating chloral with dimethylanilene and ZnCl2 (E. a. O. Fischer, B. 11, 2097). The base so prepared melted, however, at 250°. — 2. From orthoformic ether (1 pt.) and dimethylaniline (93 pta.) at 100° (Fischer a. Knorr, B. 17, 198—3. By condensation of p-di-methyl-amido-benzaldehyde with di-methyl-anil- inatorine of dry HCl gas or ZnCl2 (Boes-
DI-METHYL-AMIDO-TRI-PHENYL-PHOSPHINE. 271

neck, B. 19, 865].—From glycol, dimethyl-xaniline, and ZnCl₂ at 100°–120° (Heumann a. Wiernik, Z. 40, 484). In strong acids, benzene, or oxalic acid, dimethyl-phenylamine, and H₂SO₄, it forms formic acid and methyl violet [Fischer].

**Tri-methyl-iso-trio-iside C₃H₇N₂I₂.** [1853]. From tri-methyl-amido-phenyl-methane, Me₃, and MeOH at 100° (Hofmann a. Girard, B. 2, 449). Fischel and Washburn [1857]. Small yellow needles; yield solvents (containing alcohol), decomposes and becomes dark blue on fusion. Gives CO₂, N₂, and CS₂, as acetate.

**Hexa-methyl-opp (?) tri-amido-iso-trio-iside methane.** [1887]. Obtained by heating the corresponding tri-methyl-amido-iso-trio-iside methanes with Me₃ (Nathanohn a. Müller, B. 29, 1887). Small brown needles (from warm alcohol); v. sol. alcohol and hot water, almost insol. ether and benzene.

**Hexa-methyl-npp tri-amido-iso-trio-iside methane.** [1893]. Obtained by heating the corresponding tri-methyl-amido-iso-trio-iside methanes with Me₃ (Nathanohn a. Müller, B. 29, 1887). Small brown needles (from warm alcohol); v. sol. alcohol and hot water, almost insol. ether and benzene.


**PANISINIC ACID C₁₂H₁₇N₃O₂H₂PICO₃.** [1911]. Obtained by treating di-methyl-amido-phthalide with ZnCl₂ (Low, A. 321, 367). Needles (from chloroform), sl. sol. alcohol, m. sol. benzene, v. sol. chloroform. Its phenylhydracide melts at 225°.—B₂H₅PO₄.

**DI-METHYL-AMIDO-PHENYL-NEPH-THYL SUFONYL C₂H₅N₂SO₃H.** [1921]. Obtained together with tetra-methyl-amido-di-phenyl-methane, by heating dimethylaniline (2 mol.) with the chlorides of naphthalene (phthalic) and dibenzoyl (Michler a. Salathé, B. 12, 1786). Crystals, v. sol. alcohol and ether. Conc. HClAq at 180° splits it up into naphthalene, H₂SO₃ and aniline, and MeCl. The chlorides of naphthalene and benzene, and naphthyl mercapton. Fuming Br₂O₃ gives tetra-nitro-phenyl-aniline and naphthalene sulfonic acid.

**Di-methyl-amido-phenyl (β)-naphthyl sulphonic acid C₂H₅N₂SO₃H.** [1921]. Resembles the preceding body in its mode of preparation, properties, and decompositions (M. a. S.).

**DI-METHYL-AMIDO-PHENYL-OXAMIC ACID C₁₂H₁₇N₃O₂ i. e. NMe₂C₆H₄N=CO.CO.H.** [1927]. The ethyl ether is formed by boiling di-

**DI-METHYL-AMIDO-PHENYL-OXAMIC ACID C₁₂H₁₇N₃O₂.** [1927]. Formed by treating di-methyl-amido-phenyl-oxamic ether with alcohol KOH (Sendtner, B. 12, 532). Yields needles (from water) or plates (from alcohol).

**DI-METHYL-AMIDO-PHENYL-OXIDE C₁₂H₁₇N₃O₂ i.e. NMe₂C₆H₄N=CO.OH.** [1927]. Formed by boiling the corresponding sulphide ("thiodimethyl-aniline") with an ammoniacal alcoholic solution of AgNO₃ (Holzmann, B. 21, 2056). Stellate groups of colourless needles, insol. water, sl. sol. cold alcohol, ether, and benzene. Readily soluble in acetone. Conc. HClAq at 200° gives MeCl and aniline. B₂H₅PO₄ in minute yellow bright plates, sl. sol. hot alcohol.—Pierate. B₂H₅(NO₃)₂.OH. [150°]. Small yellow needles, sl. sol. cold alcohol and benzene.

**DI-METHYL-AMIDO-Phenyl-Di-Phenyl-Oxidine C₁₂H₁₇N₃O₂.** [1921]. Obtained by adding (4 mols.) of silver nitrate to an alcoholic solution of tetra-methyl-amido-phenyl-di-sulphide (NMe₂C₆H₄)₂S₂ (1 mol.) treated with conc. NH₃. It is also formed by the action of FeCl₃ on the latter. HCl solution of the same base. Thin silky needles, or plates. V. c. sol. alcohol, ether, and benzene, sol. hot water. It dissolves in acids, but its salts are not crystalline (Merz a. Weith, B. 19, 1573).


**Hexa-methyl-tri-amido-tri-phenyl-phosphine (NMe₂C₆H₄)₃P.** [1927]. Formed by heating dimethylaniline with PCl₃ in a sealed tube (Hannmann, B. 9, 845). Formed also as a by-product, in the action of POCl₃ on dimethylaniline in presence of AlCl₃ (S. a. M.). Colourless needles,
which turn blue on exposure to air. V. e. sol. chloroform, v. sol. dilute HClAg, m. sol. hot alcohol.

**DI-METHYL-AMIDO-PHENYL-PHOSPHINIC ACID**


**Sulphonic acid**

SO3H2C3H7O or M.C1H15NMe2

Chlorine into amido-phenol sulphonic acid suspended in water, and then adding di-methyl-aniline (F). slender needles, v. sl. sol. hot alcohol, insol. cold water and other. Its alkaline solutions are bluish. Conc. H2SO4 forms a cherry-red solution.

**TETRA-METHYL-DI-AMIDO-DI-PHENYL-SULPHIDE**

(NMe2C6H5)2S. Thioclymethylaline. [126°]. Formed by heating dimethylamine with persulphonylic acid or SOCl2 (Turini, B. 17, 584; Holzmann, B. 20, 1640; 21, 2056; Michaels u. Goedelmann, B. 25, 554).

Light-yellow needles, v. sl. sol. alcohol and benzene.

Reactions. — 1. Silver nitrate (NMe2C6H5)2SO4. — 2. On heating with reduced copper (10 pta.) at 300° it yields NPhMe.

**Sulphates**

— BbHCl2. [176°]. White mass becoming coloured in the air, extremely sol. water. — Bb2H2PCl4. 2aq. — Bb2H2FeS2. 6aq. — white powder, m. sol. water. — Bb2H2(NO3)2O. [142°]. Yellow needles (from hot alcohol). — Bb2C6H4(NO3)2OH. Amorphous. [146°]. — BbHNSO4: [168°]; pearly plates.

**Tetra-methyl-di-amido-di-phenyl-sulphide**

(NMe2C6H5)2S. Di-sulphido- or di-thio-di-methyl-alanine. [118°]. Formed by adding SCl2, diluted with petroleum-ether, to a dilute solution of dimethylaline in the same solvent (Merz u. Weih, 19, 1570).

Formed also by heating di-methyl-p-amidophenyl ethyl di-thiobenzoate with an alcoholic solution of aniline at 200° (Leuckart, J. pr. 21, 205). Small yellow needles, v. sol. CS2, more sparingly in hot benzene, alcohol, and petroleum-ether, nearly insol. water. D. P. 229°. The substance removes the sulphur at c. 230° forming dimethylaline and other products. By the action of FeCl3 or of alcoholic NH and silver nitrate, it is converted into tetra-methyl-di-amido-di-phenyl-dioxide (NMe2C6H5)2O2. By tin and HCl, or by sodium-amalgam, it is reduced to di-methyl-amido-phenyl-mercaptan, which is readily oxidised to the di-sulphide. Its salts are gummy and amorphous, and decomposed by water.

**Tetra-methyl-tetra-amido-di-phenyl-disulphide**

(NMe2C6H5(NMe2))2S. Formed by atmospheric oxidation from di-methyl-di-amidophenyl mercaptan (NMe2C6H5(NH)SH (Bernh.) and sodium (Clara u. Howitz, B. 17, 1327). Od. Methylo-iodide NMe2C6H5, Fr. [168°].

**Tetra-methyl-di-amidophenyl-dioxide**

(NMe2C6H5)2O2. From acetone (1 mol.), dimethylaline (2 molts), and ZnCl2 (Doebner, B. 12, 813). Long needles.

**Di-METHYL-AMIDO-PHENYL-QUINONIMIDE**

C18H16N2O2 i.e. C18H16N2O2, Phenol-blue. Formed by adding quinone chloro-imide to a solution of di-methyl-aniline in concentrated aqueous oxalic acid (Fogh, B. 31, 889).

Formed also by the action of NaOH on di-methyl-phenylene green (Möhlau, B. 18, 2814). Black crystals (containing 4 H2O). Yields, when treated with hot dilute HCl Ag, quinone and di-methyl-phenylene-p-diamine. May be reduced to a leno-base.

**Sulphonic acid**

SO3H2C3H7O or M.C1H15NMe2. Formed by passing chlorine into amido-phenol sulphonic acid suspended in water, and then adding di-methyl-aniline (F). slender needles, v. sl. sol. hot alcohol, insol. cold water and other. Its alkaline solutions are bluish. Conc. H2SO4 forms a cherry-red solution.
TRI-METHYL-TRI-AMIDO-DI-PHENYL-TOLYL-CARBINOL

1275. Needles (from alcohol), insol. water, v. e. sol. alcohol, ether, and benzene. HClaq at 180° splits it up into MeCl, aniline, and benzene. Zino and H₂SO₄ reduce it to phenyl mercaptaion and dimethylamine. FNO₃ gives yellow crystals of tetra-nitro-methyl-aniline [127°].

METHYL-AMIDO-PHENYL-THIAZOLE

S—C(NMe₃)

C₆H₅N₃S i.e. | CH₂CN

[188°]. From α-bromo-acetophenone and methyl-thio-urea (Trauman, A. 249, 46). Yellow plates (from ether), insol. water, m. sol. alcohol. With HClaq at 227° it yields methylamine.

TETRA-METHYL-DI-AMIDO-DI-PHENYL-

THIENYL-METHANE C₆H₅N₃S i.e. (NMMe₃CH₃)₂CH₂CH₂S. Thiophene leuco-malachite green. [93°]. Formed by heating thiophenic aldehyde with dimethylamioniane, ZnCl₂, and a little alcohol (Peter, B. 18, 635; Levi, H. 20, 561). Formed also by heating dimethyl-aniline with thienylglyoxylic acid CH₂CN.CO₂H and ZnCl₂ (P.). Needles, insol. water, v. sol. alcohol and ether. The alcoholic solution turns green in the air. MnO₄ and dilute H₂SO₄ oxidise it to the carbinol (NMMe₃CH₃)₂CH₂CH₂S(OH).CH₂S(OH), which is a brown-dark oil, sol. alcohol and ether, and forming salts which dye a splendid yellow-green (Thiophene green). — Platinio-

chlorido C₆H₅N₃S.PtCl₄. — Pierate C₆H₅N₃S.ZnCl₂(N₃)₂(OH). [5.208°]. Yellowish-


DI-METHYL-AMIDO-DI-PHENYL-THIOKETONE e. Tetra-Methyl-di-amido-thio-

BENZOPHENONE.

DI-METHYL-AMIDO-PHENYL THIO-

SULPHURIC ACID NMe₃CH₃(NH)₂.S.O₂.H. [103°—204°]. Obtained by adding an alkali to a 15% p.c. solution of methylene red until the colur is destroyed, then adding HCl and exposing to the air. Formed also by the action of a strong solution of SO₃ on di-methyl-

di-amido-phenyl mercaptan (Borbnthson, A. 251, 1). Crystals, sol. at cold water and alcohol. Its dilute aqueous solution gives a purplle colour with traces of iodine or of FeCl₃. The hydroy-

chloride crystallises in prisms.

Reactions. 1. A mixture of di-methyl-dimethyl-amidophenyl thiosulphuric acid with dimethyl-

aniline when oxidised by K₂Cr₂O₇ and H₂O₆ forms the indamine C₆H₅N₃S(NMe₃) which yields a green emerald-green powder (containing salt), and yields H₂SO₄ when heated with H₂SO₄. Reduction, by means of alcohol and acids.—2. A mixture of the thio-sulphuric acid with aniline hydrochloride gives on oxidation with N₂H₄.HClS i.e. CH₂CN.CH₂S(NMe₃)

C₆H₅N₃S.O₂H. (an insoluble green compound decomposed by water. Prolonged boiling with dilute FeCl₃ gives C₆H₅N₃S(NMe₃)S, a blue powder with bronze lustre.—3. A mixture of di-methyl-dimido-phenyl thiosulphuric acid with α-toluidine yields on oxidation the homologous C₆H₅N₃S.O₂H as a blush-grey powder.

Tetra-methyl-amido-phenyl thiosulphuric acid C₆H₅(NMe₃)₂.S.S.O₂.H. [175°—182°]. Obtained by dissolving tetra-methyl-p-phenylene diamine (2.7 g.) in HCl (1:56 c.c. of 33 p.c.) and adding aluimium sulphate (10 g.), and sodium thiosulphate (6.6 g.) dissolved in water (36 c.c.). A cold solution of K₂Cr₂O₇ (25 c.c. of a 6-7% p.c. solution) is then added, and the resulting liquid left to stand. The precipitate which then separates is recrystallised from alcohol (Borbnthson, A. 251, 60). Plates, sol. hot water and acides. Zino and HCl reduce it to the mercaptan C₆H₅(NMe₃).SH.

TETRA-METHYL-DI-p-AMIDO-DI-PHENYL-

THIO-UREA C₆H₅N₃S i.e. (NMMe₃CH₃.NH).S. [168°]. Formed by boiling di-methyl-p-phenyl-

diazone with alcoholic CS₂ (Baur, B. 12, 638). White needles, insol. water and cold al-


TRI-METHYL-TRI-AMIDO-DI-THIO-

TOLYL-CARBINOL C₆H₅.N.O. Formed by heating rosanine chloride (1 pt.) with Me₂NCHO (2 pts.), MeOH (8 pts.), and KOH (1 pt.) (Hofmann). Formed also by allowing an alcoholic solution containing rosaline and iodine green to stand in the cold (Giraud a. Willm, Bl. [2] 25, 200). The salt NHMe₃.CH₃.CH₂.OH(NMe₃)C₆H₅NMeCl is one

of the substances known as Hofmann's violet (Hofmann, C. R. 54, 428; 66, 945, 1033; 57, 1131). Its absorption-spectrum has been studied by Hartley (C. J 51, 172).

Penta-methyl-tri-amido-di-phenyl-tolyl-

carbinol NMe₃.O₂H.Me.O(C(OH)(NMe₃)).C₆H₅.NMe₂. The chloride NMe₃.O₂H.Me.C₆H₅.NMeCl appears to be probably the chief constituent of Hofmann's violet obtained by heating rosamine with MeCl₂. It has a green lustre and forms a violet solution in water. The solution is decolourised by zinc-

dust. HCl turns the solution first green, then yellow. NaOH gives a brownish-red pp. Cone.

H₂SO₄ gives a brownish-yellow solution changed, on dilution, through green to blue. It dyest wool, silk, and mordanted cotton violet.

Hexa-methyl-tri-amido-di-phenyl-tolyl-
carbinol NMe₃.CH₃.CH₂.OH([NMe₃]C₆H₅.NMe₂). The zinc double salt of the methyl-chloride of this body C₆H₅.N₂Cl.Zn or NMe₃.CH₃.CH₂.OH(NMe₃)Cl appears to constitute the dye known as 'iodine green,' which is obtained by heating rosamine with MeCl₂, or by the action of MeCl on Hofmann's violet.
corresponding iodo s, \( C_8H_5N, I \), is obtained by heating \( \text{MeI} \) (3 pts.) with \( \text{MeOH} \) (2 pts.) and rosiniline (1 pt.) at 160° (Hofmann a. Girard, B. 4, 440). The zinc chloride diiodide forms a bluish-green aqueous solution, turned reddish-yellow by hydrochloric acid, and rendered colourless by caustic soda. It dyes silk green. When heated strongly in the dry state it becomes violet. Its absorption-spectrum has been studied by Hartley (C. J. 61, 175). Iodine green may be, reduced to a transparent-iodine by di-phenyl-toly-1-meth- ane NMeCH\(_2\)CH\(_2\)CH\(_2\)NMe\(_2\) [178°] (O. Fischer a. G. Körner, B. 16, 2010). Besides the bodies here described other methylated rosanilines are doubtless formed in the methylation of rosiniline.

**DI-AMYL-AMIDO-PHENYL-P-TOLYL SULPHONIC ACID**, \( C_8H_5O \), etc.

From \( C_8H_5O \) and dimethylamine (Michler a. Mayer, B. 12, 1798). Split up by HCl at 180° into MeCl, aniline, H\(_2\)SO\(_4\) and tuzine. Tuzine and H\(_2\)SO\(_4\) reduce it to p-tolyl mercapton and dimethylaniline.

**DI-METHYL-p-AMIDO-PHENYL-UREA**, \( C_8H_5N, O \) i.e. \( \text{NH}_2\text{CO.NH}_2\text{CH.NMe}_2 \) [179°]. From polycyanate and di-methyl-p-phenyl-urea-dianime (Binder, B. 12, 536). Long needles, sol. hot water. B'\(_2\)H\(_2\)PCl\(_2\); yellow leaflets.

**TETRA-METHYL-p-DI-AMIDO-PHENYL-UREA**

From \( C_8H_5N, O \), i.e. CO\( (\text{NH}_2\text{CH.NMe}_2) \) [262°] (B.); [246°] (M. a. Z.). Obtained by heating urea with di-methyl-p-phenyl-diamine (Binder, B. 12, 585). The same body is apparently obtained by the action of COCl on di-methyl-p-phenyl-diamine (Michler a. Zimmermann, B. 2, 14, 2179). B'H\(_2\)Cl: soluble crystalline powder. B'H\(_2\)SO\(_4\); sol. water. B'H\(_2\)PCl\(_2\).

**METHYLAMIDO-PROPANE SULPHONIC ACID**

\( \text{NMeCH.CHMeSO}_2\) [220°-223°] (Gabriel, B. 22, 2930). Colourless needles, v. sol. water.

**METHYL-p-AMIDO-PROPANIC ACID**

\( \text{CH}_3\text{CHOH} \) i.e. CH\(_3\)\(_2\text{NMe.CO} \) [260°].


**DI-METHYL-p-AMIDO-PROPANIC ACID**

\( \text{CH}_3\text{CHOH} \) i.e. CH\(_3\)\(_2\text{NMe.CO} \) [260°].

Formed by treating a \( p \)-choloro-propionic ether with trimethylamine, saponifying the resulting ether with baryta, and adding HCl (Brüh, B. 9, 84). Very hygroscopic, forming C\(_2\)H\(_5\)\(_2\text{NMe.CO} \).PICl, crystallising in roseate prisms, and C\(_2\)H\(_5\)\(_2\text{NO} \).AuCl\(_2\), crystallising in golden needles. The corresponding Anhydride of the Methylo-hydroxyde CH\(_3\)\(_2\text{CH} = \text{CO} \) \(_2\) \(_0 \) ox. betaine "a" formed on adding baryta to the methylo-chloride and subsequently neutralising with H\(_2\)SO\(_4\). It forms crystals which are soluble in reaction. The iodide \( \text{C}_8\text{H}_5\text{NMe Sinkler forms long colourless prisms, v. sol. alcohol and hot water.}

**DI-METHYL-p-AMIDO-PROPYL ALCOHOL**

\( C_{12}H_{25} \_\text{NMe} \), etc.

Tetra-methyl-\( p \)-di-amido-isopropyl alcohol \( C_8H_5N \_\text{O} \) i.e. \( \text{NMMe_2 OB} \_\text{O} \).OH. (170°-185°). Formed from di-chloro-isopropyl alcohol (\( p \)-di chlorhydrin) and \( \text{NMMe_2 H} \) at 60° (Beesley a. F. 13, 610). Liquid, v. sol. water. B'H\(_2\)PCl\(_2\); yellow plates.

**Benzoyl derivative** (\( \text{NMMe_2 OB} \_\text{O} \)).OH. Forms a platino-chloride B'H\(_2\)PCl\(_2\), crystallising in tables.

**DI-METHYL-p-Acrylene GLYCOL**

\( C_8H_5\_\text{NMe}_2 \_\text{OH} \) i.e. \( \text{NMMe_2 CHOH} \).OH. (317°). From dimethyamine and \( \text{chloro}-p\)-acylene glycol (chlorhydrin) (Both, 15, 1159). Thick syrup; v. sol. water, alcohol, and ether. B'H\(_2\)PCl\(_2\).

**Methyl-chloride**

\( \text{NMMe_2 CH.CH(OF)OH} \).OH. From the chlorhydrin and \( \text{NMMe_2 H} \) at 106° (V. Meyer, C. 2, 186; Hanriot, A. Ch. 17, 99). Needles, v. sol. water. C\(_2\)V\(_2\)NO\(_2\)PCl\(_2\); crystalline tablets. C\(_2\)H\(_5\)\(_2\text{NO} \).AuCl\(_2\), [190°]. Orange crystals, m. sol. alcohol.

**Di-benzoyl derivatives**

\( \text{NMMe_2 CH.CH(OH)OB} \).OH. (100°). Lamine (Both, 15, 1159).

**DI-METHYL-(B. 3)-AMIDO-QUINALINE**

\( \text{NMMe}_2 \_\text{OH} \) i.e. \( \text{CH.CH.CN} \) [56°].

**Methyl ammonium-bromide**

\( \text{NMMe_2 CH.CH(OH)OH} \).OH. Very fine orange needles [215°].

**DI-METHYL-iodide** B'MeI: long red needles.

**B'MeCl.PCl\(_2\)**.

**Methyl-chloride** B'MeCl.aq. [244°]. Long scarlet hygroscopic needles (Osterneyer, B. 18, 590).

**Methylo-chloride of the tetrahydrich**

\( \text{NMMe_2 CH.NMeCl aq} \): [230°], fine colourless needles. With \( \text{ICl} \), it forms \( \text{NMMe_2 CH.NMeCl} \) [127°], separating in small yellow crystals (Osterneyer, B. 18, 590).

**TETRA-METHYL-AL-AMIDO-QUINONE**

\( \text{C}_{12}\text{H}_{25} \_\text{NMe}_2 \_\text{O} \) [174°]. Red tables. Formed by dissolving ordinary quinone in aqueous dimethyl-amine (Mylius, B. 18, 467).
solutions in benzene and CS₂ are dark red with green fluorescence.

2. Water at 120° under pressure also forms CO(C₆H₄NMe₃), etc. Benzyl chloride is converted into CCl₄(C₆H₄NMe₃), a greyish-green powder, decomposed by water with production of CO(C₆H₄NMe₃).—5. Aniline hydrochloride at 160° forms phenyl-auramine NPh(C₆H₄NMe₃), (171°).—6. Phenyl-hydrazine at 100° forms CO(C₆H₄NMe₃). Aniline at 160° also forms this ketone.—7. Hydroxyamine gives the oxim of tetra-methyl-di-amido-benzophenone.—8. Distillation over red hot zinc dust yields di-methyl-aniline and tetra-methyl-di-amido-di-phenyl-methane.—9. Decyl chloride in the CS₂ solution forms C₆H₄N₃SClCl, which forms a red alcoholic solution and a greenish-yellow solution in benzene. It begins to decompose at 160°.—10. Benzoyl chloride in CS₂ forms a similar compound C₃H₅N₂SBClCl which is insoluble in water, but decomposed by solution in alcohol.

11. Benzyl with Ag₂O and NaOAc forms C₆H₄N₂SO₄, a dark-grey powder.—12. Methyl iodide appears to give C₆H₄N₂SMeI which forms green plates with copper lustre, decomposes at 108°, and yields a deep bluish-green aqueous solution with red fluorescence. It dyes all substances. In CS₂ solution forms a black powder, probably C₆H₄N₂SCSCl₂.

In chloroform solution, CS₂ forms white crystals of C₆H₄(NMe₃)CHCl₃.

**METHYL-AMIDO-THYMOCOQUINE**

C₆H₄NO₂ t.e. C₆H₄CMe(NHMe)O₂. [74°]. From methylamine and thymoquinone in alcoholic solution (Zinke, B. 14, 167). Dark-violet lamina (from very dilute soln). Volatile with steam. M. sol. water, v. e. sol. alcohol. The solutions are deep violet. Alcoholic HCl converts it into methylamine and oxymethyloquinone.

**Di-methyl-amido-thymoquinone** C₆H₄NO₂ t.e. C₆H₄CMe(NHMe)O₂. [203°]. Formed, together with methyl-amido-thymoquinone, by treating a cold concentrated alcoholic solution of thymoquinone with methylamine (Zinke). Formed also by the action of methylamine on di-bromo-thymoquinone. Long reddish-violet needles (from alcohol). Decomposed by KOH or H₂SO₄ in alcoholic solution into methylamine and di-oxymethyloquinone.

**METHYL-AMIDO-TOLUENE v. METHYL-TOLUOLIDINE**

**Methyl-di-amido-toluene** v. **Methyl-toluclidine**

**Methyl-tri-amido-toluene** C₆H₄N₃ t.e. C₆H₄Me(NHMe)₃ (NHMe). The hydrochloride B₃H₆Cl₆aq is prepared by reducing the nitramine of di-nitro-methyl-toluolide with tin and HCl (Van Rombourgh, R. T. C. 8, 400). It forms small crystals.

**Di-methyl-amido-toluene sulphonio acid** C₆H₄NSO₃ t.e. NMethyloCH₂MgSO₃H [2:14:7]. Formed by heating di-methyl-o-toluidine (1 pt) with H₂SO₄ (4 pts) at 180° to 210° (Mishler a. Sampayo, B. 14, 2108). Large glittering prisms (from water); insol. alcohol v. sol. hot water. — Ca₂⁺ (dried at 130°). Nodules. — Ba₂⁺ (dried at 130°). Lamine v. sol. hot water. — Zn₂⁺: needles.

**TETRA-METHYL-DI-AMIDO-DITOLYL**


**Tetra-methyl-di-amido-ditolyl C₆H₄N₃ t.e. NMethyloC₆H₄MgC₆H₄MeNMethylo [190°].** Formed in small quantity by heating dimethyl-o-toluidine with H₂SO₄ (M. a. S.). Long needles; sol. hot alcohol, ligroin, and ether, insol. water. Gives a green colouration with Fe₃Cl₆ and yellow colour with CrO₃.

**Tetra-methyl-di-amido-ditolyl (1) C₆H₄N₃ t.e. NMethyloC₆H₄MgC₆H₄MeNMethylo [57°].** Prepared by heating dimethyl-p-toluidine with H₂SO₄ (Mishler a. Pattinson, B. 14, 2167). White needles; sol. alcohol and ether, insol. water. — B₃H₆Cl₆PtCl₆.

**DI-METHYL-AMIDO-TOLYL-BUTANE**

C₆H₄N₃ t.e. C₆H₄C₆H₄MeNMethylo. [251°]. From amido-tolyl-butan and MeI (Effront, B. 17, 2839) — H₂PtCl₆.

**DI-METHYL-AMIDO-TOLYL METHYL KETONE**

C₆H₄NO t.e. [1:2:5]C₆H₄(C₆H₅)(NMethylo).CO.CH₃. [95°]. Flat yellowish prisms; v. e. sol. alcohol, ether, and hot water, nearly insol. petroleum-ether. Formed by methylation of amido-tolyl methyl ketone (Klingel, B. 18, 2699).

**METHYL-α-AMIDO-VALERI7 ACID** C₆H₄NO₃ t.e. CH₃CH₂CH₂CH₂(NHMe)CO.H. Obtained by heating butyric aldehyde with conc. aqueous H₂CO₃, adding methylamine and heating again. The nitrite then separates as an oil, which is hydrolysed by prolonged boiling with dilute HClaq (Monozzi a. Belloni, G. 17, 116). Long glistening needles (containingaq): decomposed partially at 110° with formation of a sublimate.

**Salts.** — Cu₂⁺, 2aq: blue prisms. — HA₃NO₃: prisms, v. sol. water.


**Di-methyl-α-amido-isovaleric acid.** Methylo-iodide of the methyl ether.
METHYL-AMIDO-VALERIC ACID.

Pr.CH(NMe₂)₂.CO.Me. Formed by heating MeI (4 pts.) with zine amido-valerate (1 pt.) and ZnO (1 pt.) at 110° for 16 hrs. (Duviiller, C. R. 110, 640). Yields {Pr.CH(NMe₂)₂.CO.H₄}, PCl₄,₄aq and Pr.CH(NMe₂)₂.CO.H₂Cl₂.


Formation. — 1. Discovered by Wurtz, who obtained it by distilling methyl cyanate (or cyanurane) with potash (C. R. 28, 223, 225; A. Ch. [3] 21, 35). Fuming methyl cyanate with potash (Wurtz.) — 3. In small quantity, together with NH₄Me and NMe₄, by heating ammonia with MeI (Hofmann, A. 79, 19).


Preparation. — 1. By distilling methyl cyanurate with aqueous KOrt (Wurtz). The distillate is received in dilute HCl, and the methylamine hydrochloride dried and distilled with quicksilver.

2. A mixture of acetamide (1 mol.), and bromide (1 mol.) is treated in the cold with a 10 p.c. solution of KOH till nearly decolorised. The acetamide thus obtained is then run in a slow stream into a 30 p.c. solution of 3 mols. of KOH heated to 60°-70° and digested for 10 or 15 mins. till decolorised. The solution is then boiled and the methylamine received in HCl; the yield is 97 p.c. of the theoretical (Hofmann, B. 15, 765; 18, 2741).

3. Methyl nitrate (1 mol.) is heated in closed vessels at 100° with a solution of ammonia (1 mol.) in wood spirit. Besides the nitrate of mono-methyl-amine there is formed tetra-methyl ammonium nitrate together with small quantities of di- and tri-methylamine nitrates. At the end of the reaction the product is neutralised with sulphuric acid, heated to evaporate off the alcohol, and the residue decomposed by potash, and the bases received in hydrochloric acid. The hydrochlorides are treated with absolute alcohol to remove the ammonium chloride, and again decomposed, the bases being received in sulphuric acid. The sulphates are then treated with absolute alcohol in which mono-methylamine sulphate is insoluble. To remove the last traces of impurities the insoluble sulphate is again decomposed and converted into di-methyl-oxamide, which yields on decomposition pure mono-methyl-amine (Duviiller a. Buisaine, A. Ch. [5] 23, 317; cf. Junod, A. Ch. 48, 445). — 4. By the action of chlorine on methylamine. (Wallach, A. 184, 51; cf. Geisse, A. 109, 282). — 5. By heating dry ammonium methyl-sulphate at 300° and distilling the product with potash (Müller, A. Ch. 10, 276).

Properties. — Colourless gas with strong ammoniacal odour. Not solid at —75°. Turns limus blue. Fuses with water to form a solution which is absorbed by water and by charcoal. Of all known gases it is the most soluble in water. Burns in air with livid yellowish flame (difference from NH₃). The aqueous solution of methylamine is extremely caustic, and gives off the gas when boiled. It pts. metallic salts, for the most part in the same manner as ammonium. Zinc hydroxide is, however, soluble in a large excess of methylamine. With cupric salts it gives a bluish-white pp. dissolving in excess and forming a deep-blue solution. With salts of Cd, Ni, and Co it forms pps. insoluble in excess (difference from NH₃). It pts. lead nitrate but not lead acetate. Copper in acetate gives a black pp.; with HgCl₂ a white pp.; with AgNO₃ it gives a pp. of Ag₂O soluble in excess. It dissolves AgCl. With chloride of gold it gives a brownish-yellow pp., soluble in excess. Platinio chloride gives a yellow crystalline pp.

METHYLAMINE.

Valeryl derivative \( \text{C}_7\text{H}_7\text{NO}_2 \text{H}_2 \text{O} \).

Heptyl derivative \( \text{C}_7\text{H}_{14}\text{NO}_2 \).

Benzyl derivative \( \text{C}_6\text{H}_5\text{NO}_2 \).

Cyclohexyl derivative \( \text{C}_6\text{H}_{11}\text{NO}_2 \).

Octyl derivative \( \text{C}_8\text{H}_{17}\text{NO}_2 \).

Decyl derivative \( \text{C}_{10}\text{H}_{21}\text{NO}_2 \).

Dodecyl derivative \( \text{C}_{12}\text{H}_{25}\text{NO}_2 \).

Methylamino derivative \( \text{C}_7\text{H}_7\text{N} (=\text{H})\text{O}_2 \).

Formammonium. — 1. One of the products of the action of Me on ammonia (Hofmann).—2. A mixture of mono-, di-, and tri-methyl-ammonium is obtained by heating methyl alcohol with ammoniacal \( \text{ZnCl}_2 \) at 200°-220° (Mersa. a. Gasiorowski, B. 17, 639).—3. In small quantity by heating the sulphide of aldehyde-ammonia in a sealed tube, or by distilling it with lime (Petersen, A. 102, 817).

Methylamino derivative \( \text{C}_7\text{H}_7\text{N} (=\text{H})\text{O}_2 \).

Cyclohexyl derivative \( \text{C}_6\text{H}_{11}\text{N} (=\text{H})\text{O}_2 \).

Decyl derivative \( \text{C}_{10}\text{H}_{21}\text{N} (=\text{H})\text{O}_2 \).

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METHYLMINE.

Preparation. — 1. The mixture of iodides obtained by heating ammonia with MeI is distilled with potash, and the evolved bases dried by KOH and condensed by a freezing mixture, the bases MeI, MeBr, and MeCl being separated by means of oxalic ether (Hofmann, Pr. 13, 280).

2. The bases obtained from MeBr and NH₂ are treated with nitrous acid, and the dimethyl-nitramine decomposed by HCl and distilled over sodium (Hofmann). — 3. Nitroso-dimethyl-aniline hydrochloride (2 pts.) is boiled with water (90 pts.) and NaOH (10 pts. of S.G. 1.26) (Baeyer a. Caro, B. 7, 964; 8, 616).

Properties. — Highly alkaline liquid or gas. Has not been solidified. If it is formed in the cold, it solidifies to form a characteristic yellow powder of tri-nitro-dimethyl-aniline (Frun Romberg, K. T. C. 2, 100).


Acid-derivative NMe₂Ac. (166°). S.G. 80.941. From dimethylamine and AcCl dissolved in ether (Franchimont, R. T. C. 2, 121, 342).

Colourless liquid, forming HNO₃ forms in the cold NMe₂NO₃ [57°].

Tri-chloro-acid-derivative

C₂Cl₅NO₂ [104°] (C). S.G. 1.414 (F. a. E.). From C₂Cl₄COCl₂ and NMe₂ (Clocx, A. Ch. 9, 9, 145).


Valery derivatives C₂Me₂CONMe₂ (188°). S.G. 1.201. Liquid, v. sol. water. Not solidified at °17°. HNO₃ (S.G. 1.323 forms NMe₂NO₃.

Benzyl derivatives CH₃CONMe₂ (187°) (S.G. 205°, uncr.). Crystals, v. sol. water. Split up by aqueous HCl at 200° into HOBz and HNO₃ (Hallmann, B. 9, 846). Cone. HNO₃ gives CH₁(NO₂)CONMe₂ (Romburg, P. T. O. 4, 355). With OOC₂H₂ it forms deliquescent crystals of C₂H₅CONMe₂ (35°) decomposed by water into HCl and C₂H₅CONMe₂.

Di-methyl-tolu-amine, NMe₂. From dimethylamine, iodine, and NaOH. Pale-yellow pp., which rapidly decomposes (Bachig, A. 230, 239).

Dimethyl-nitramine NMe₂NO (148° at 725 mm.). Formed by treating an aqueous solution of dimethylamine hydrochloride with potassium nitrite (E. Fischer, B. 8, 1587; Renouf, B. 13, 2169). Yellow oil. Volatile with steam. Reduced by zinc-dust and HNO₃ to di-methyl-hydrazine. Decomposed by boiling HCl into NMe₂H and nitrous acid. — B₂H₂Cl: white needles, decomposed by water or alcohol.

Di-methyl-tolu-amine NMe₂NO₂ [57°]. From NMe₂Ac and HNO₃ (Franchimont). Large crystals.

Di-methyl-amine-tri-bromide Me₂Br, 2aq or H₂[N=O(H)]Br. Formed as a yellow pp., on adding an excess of bromine-water to a cold solution of dimethylamine — 2Me₂NH + 4Br + 2H₂O = CH₂Br₂ + NH₂Br + Me₂NHBr. Yellow powder. Solv. alcohol and ether, v. sol. water. It is very unstable: on keeping over-night in a closed vessel it liquefies to a brown fluid containing free bromine; but under water it can be kept for several days. Alkalis and acids decompose it at once; thus HCl gives dimethylamine hydrochloride according to the equation C₂H₅Br₂NO₂ + 2HCl = C₂H₅NH₂HCl + 2Br + 2H₂O (Bachig, B. 13, 2249).

Trimeethylamine C₂H₅N i.e. NMe₃ Mol. w. 59. (35°). S.G. 0.6502 (Hofmann, B. 22, 703). H.F.p. 11.870 (Thomson, Th.). 1400 (Müller, B. 24, 669). H.F. 1,3550. H.C. 677.600. Moist heat (by HCl) 17.900 (Müller, A. Ch. 9, 15, 531).

Occurrence. — In herrning-brine (Hofmann, C. S. 5, 288; cf. Wertheim, J. 151, 460). In the flowers of Crategus oxyacantha (Wickre. A. 21, 121), G. monoquya, Fyrus arrays, and P. communis (Wittacin, A. 165, 1470). In the stinking goosefoot (Chenopodium vulvaria) (Desaignes, J. 1851, 481) in Arnicia monlana (Hesse, J. 1864, 459) and in the seeds of the keeech (Brandl a. Rakowick, J. 1864, 607).

It also occurs in Mercurialis annua (E. Schmidt, B. 10, 2230). In human urine (Dessaignes, A. 100, 218), and in calves' blood which has stood 12 hours (Dessaignes, J. Ph. B. 32, 48). In ergot of rye-Walz, J. 1859, 552; Rihstausen, Rep. chim. pur. 1863, 420; cf. Bricker, H. 11, 184).

In small quantity in guano (Hesse, J. 1867, 493). In bone oil (Anderson, A. 80, 61). According to Ludwig (2, 4, 96) it occurs in small quantity in several Austrian, Hungarian wines. In the product of the destructive distillation of putrid brain (Sulpis, G. 6, 468) and of beet-root molasses (Vincent, A. 84, 1189; 85, 667; J. Ph. B. 40, 138; Roscoe, C. N. 89, 107). In the putrefaction of yeast (A. Müller, J. 1857, 409) and of whea dough (Sullivan, J. 1859, 231).

In most of the cases here mentioned the tri-methylamine is probably obtained from betaine,
neurine, or lecithin, either by putrefactive decomposition or in the chemical treatment.

Formation.—1. Together with NMe₂H and NMe₃H by the action of ammonia on MoI, and separated by treatment with oxalic ether, with which it does not react (Hofmann, C. J. 4. 304).


Preparation.—1. The residues in the preparation of sugar from beet-root are, after fermentation, subjected to dry distillation. The aqueous portion of the distillate is neutralised by H₂SO₄, ammonium sulphate separated by crystallisation, and, after evaporation, the trimethylamine expelled by an alkali.* Commercial trimethylamine still contains methylamine, ethylamine, dimethylamine, propylamine, and isobutylamine. The proportion in which these bases are present varies greatly in different samples, and that of the bases other than oxalic ether is added, the primary bases being p.p. as di-alkyl-oxamides. The mother-liquor is distilled with addition of KOH and the dry bases dissolved in absolute alcohol. Oxalic ether is then added to the alcoholic solution, when the di-alkyl-oxamides are precipitated. The trimethylamine can be obtained by distillation (Vincent, C. R. 89. 238; 788; Duvalier a. Buisine, C. R. 89. 48; 709; 92. 256; A. Ch. [5] 23. 293; cf. Eisenberg, B. 13. 1669).

2. Perfectly pure trimethylamine is obtained by distilling NMe₂OH and rectifying over potassium (Hofmann, B. 22. 699).

Properties.—Gas with ammoniacal and fishy odour. Remains liquid at 75°. V. e. sol. water. When an aqueous solution is strongly cooled a hydrate NMe₃C₇H₇aq [4·3°] separates.

Reactions.—1. KMnO₄ oxidises it to CO₂ and oxalic acid (Wallack a. Claisen, B. 8. 1237.)

2. At a red heat it is converted into HClO₄ and N₂Me₂ (Willin, Bl. [3] 41. 449). Passed through a glass tube with a red-hot tube it yields N₂H₄, cyanogen, hydrocarbons, and CH₂(NMe₂) (Romney, B. 11. 835).—3. CS forms NMe₂CS₂ crystallising in white needles [152°]. This body is m. sol. chloroform and dilute alcohol, nearly insol. absolute alcohol, CS₂, and benzene. It splits up into its components, even at ordinary temperatures, but with dilute HCl it forms NMe₂CS₂HCl and (NMe₂CS₂)₂H₂Cl₂. Conc. HClaq splits it up into its components. Phosphoric acid forms (NMe₂CS₂)₃H₃PO₄ (Bleunard, C. R. 87. 1040).—4. Glycol chlorhydrin forms neurine chloride NMe₂Cl₂CH₂OH·HClO₄. Chlor-acetic acid forms betaine OH·NCO₃CO₃O₃.<BR>


8. When heated with aniline hydrochloride it yields a diastere of methyl-aniline.

Salts.—B'HCl: decomposes at 285°, giving off NMe₂H and MeCl, and leaving mono- and dimethylamine hydrochlorides. At 305° ammonia and methyl chloride are given off from the residue, and at 325° the whole has sublimed, the sublimate consisting of NH₃Cl and methylamine hydrochloride. This decomposition may be utilised for the manufacture of MeCl (Vincent, C. R. 84. 1139; 85. 666).—B'HBr: decomposed between 230° and 300° into NMe₂H, ammonia, and MeBr. —B'HI: white scales, decomposed between 210° and 280° into NMe₂H, ammonia, MeI, and a residue of NMe₃I. —B'H₂PtCl₆: orange regular crystals (Eiseng. J. 1888. 612; Topce, J. 1883. 618). S. (alcohol) 6302. More soluble than the di- and still more so than the mono-methylene platinum chloride (Eiseng. A. 205. 139).—B'H₂IrCl₆: reddish-brown octahedras (Vincent, Bl. [2] 43. 155).—B'YlNCl₃: yellow monoclinic crystals. V. e. sol. water, sol. alcohol. [320°] (Hesse, J. pr. 71. 480; Zay, G. 18. 420).—B'H₂RhCl₆, 9aq (Vincent, C. R. 101. 329).—B'H₂OCl₆: triclinic crystals (Hjorts. J. 1892. 475).—B'H₂HgCl₄: monoclinic crystals (T.).—B'H₂HgCl₅: monoclinic crystals (T.).—B'H₂HgCl₆: rhomboedric crystals (T.).—B'H₂HgCl₇: monoclinic crystals. B'H₂CdBr₆: six-sided hexagonal prism. B'H₂ScBr₆:—B'H₂I₃BrI₃:—B'H₂I₃BrI₃: six-sided crimson plates (Kraut, A. 210. 316).—B'HNO₃ [153°]. Long needles or prisms, v. sol. hot alcohol (Franchimont, R. T. C. 2. 338).—B'H₂SO₄·Al₂(SO₄)₂, 2aq [106°]. Large crystals (Reckensch. A. 83. 343).—B'H₂OCl₆·(V₂O₆), 7aq (Bailey, C. J. 45. 692).—B'H₂OCl₆·(V₂O₆), 7aq (Loschmidt, J. 1855. 375).—Benzene sulphonate [89°] (Westhoff. Am. 10. 129).

Tetra-methyl-ammonium hydroxide NMe₄OH. Heat of neutralisation (by HCl) 27.906 (Müller, A. Ch. [5] 16. 531). Obtained by digesting NMe₄I with moist Ag₂ (Hofmann, Tr. 1860. 98; C. J. 4. 321). White crystalline deliquescent mass, v. sol. water. Absorbs CO₂ with avidity. Its solution is strongly alkaline and caustic. Decomposed by heat into NMe₄ and MeOH (Hofmann, B. 14. 491). Neutralises acids, forming the following salts. Iodide NMe₄I. S.G. 1. 1827; 1. 183 (Clarke, Am. S. [8] 16. 401). The chief product of the action of MeI on ammonia and on mono-, di-, and tri-methylamine. Best obtained by heating a solution of NH₄ in methyl alcohol with MeI at 100°-120° (Lawson a. Collie, C. J. 53. 624). Dimetric prisms (from water). Sol. water, almost insol. alcohol, insol. ether. Decomposes at a dull red heat into NMe₄ and MeI. Unites with iodide forming red crystals of NMe₄I₂C₂H₄I₄. When heated with liquified NH₃, in which potassium has been dissolved, the products are KI, NMe₄, and ethers (Thompson a. Ould, C. J. 53. 701). Unites with halogens, forming NMe₄I₄ (Welzien, A. 91. 41; 99. 1), NMe₄I [130°], NMe₄I [110°] (Genther, A. 240. 68). NMe₄I₄, NMe₄I₆, NMe₄I₈, (NMe₄I)₆Cl₄, (W.), NMe₄Br, [100°] (Odborn a. Masson, J. 40. 58). NMe₄Cl and NMe₄Br, [210°-230°]. The compound NMe₄Br is converted by ammonia into NMe₄LNH₂, a dark-coloured explosive state (Stahlh. B. S. 119. 421).—NMe₄H₂PtCl₆: small light-yellow prisms, m. sol. alcohol.—(NMe₄I)₂H₂PtCl₆: lemon-yellow scales (Kisse, A. 107. 233).—NMe₄I₂S₂H: amorphous scarlet pp. (Kraut, A. 320. 816).—NMe₄HCl₂: white crystals. On heating for
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long time at 200° it is converted into the isomerism 
NM,N,CH,Cy (Thompson, B. 16, 2338). Long colourless prism or slender needles; v. e. sol. water and alcohol, insol. ether.


Fluoride NMFa. From the hydroxide and HF. Radiating crystals. Decomposes at 180° into NMe2 and MeF (L. a. C.).


Nitrite NM,NO2. From NMeI and AgNO3. Deliquescent crystals. Decomposed above 300° into NMe, MeNO2, MeO, NO, and oxygen (L. a. C.).

Sulphate (NM,SO4. [280°]. Deliquescent crystals. Decomposed above 290° into NMe, and NMe2SO4, which then undergoes further decomposition (L. a. C.).

Chromates (NM,OsO4. Orange triclinic crystals, v. sol. water (Hjortdahl, J. 1892, 475).—(NM,OsO4.3H2O; oranges, triclinic crystals, v. sol. water.

Sulphite NM,SO3H 2aq. [180°]. Decomposes above 300°, yielding NMe, SO3, MeOH, and other products (L. a. C.).

Suphtrae NMeSH. Very deliquescent. Decomposes above 200° into NMe, and MeSH.

Phosphate From NMeI and Ag2PO4. Forms a strongly alkaline solution. Decomposed at a high temperature into NMe2, methyl alcohol, and HPO4 (L. a. C.).

Vandate NMe2VO4 (Bailey, C. J. 45, 693). Carbonates NMe2CO3H. H. F. 20.870 (Müller). Obtained by saturating a solution of the base with CO2 (L. a. C.). Deliquescent crystals, decomposing above 180° into NMe2, methyl alcohol, and CO2. —(NMe2)CO3H. H. F. 19.100. Obtained by acting on NMe2I (2 mols.) with Ag2CO3 y Ag2O (Müller, Bl. [2] 44, 191).

Oxalate (NM2)C2O4. Formed from NMe2 and oxalic acid, or from NMe2I and silver oxide. Deliquescent crystals, decomposed above 200° into NMe, and methyl oxalate, the latter being further resolved into Me2O, CO, and CO2.

Cyanide NMe, Cy. Prisms. Sublimes at 298°. V. sol. water, m. sol. alcohol, insol. ether and chloroform (Mallinckrodt, Bl. [2] 16, 273).—NMe2CyHgCy. [275° uncor.]. Yellow crystals. —NMe2CyAgCy. [212° uncor.]. From AgCy and NMeI or NMe2Cy (Thompson, B. 16, 2338). Long colourless prism or slender needles; v. e. sol. water and alcohol, insol. ether. On dry distillation it yields NMe2, acetone, nitride, and methyl carbamine.

Ferrocyanides (NMe2)2FeCy. 18aq. Laminogranular mass (Barth, B. 8, 1843).—(NMe2)2HFeCy. 2aq. (E. Fischer, A. 190, 184.)

Ferricyanides (NMe2)2FeCy3aq. From NMeI and silver ferrocyanide (Bornhem, B. 12, 408). Unstable bygroscope prism; sol. water, insol. alcohol. Cobalticyanide (NMe2)2CoCy. 18aq. Yellow crystals (C. a. M.).

Acetate NMe2OAc. [67°]. From NMe2OH and H2OAc. Deliquescent needles, decomposed at 390° into NMe2 and MeOAc (L. a. C.).

Benzene NMe2OBr. [220°-230°]. Long deliquescent needles. Decomposed above 230° into NMe2 and MeOBr (L. a. C.).


Trimethylamine ethylenedioildide C,CH,NI i.e. NMe2Et. From NMe2 and EtI (Müller, A. 108, 1). Gives the following derivatives (Topsoe, J. pr. 1883, 620).—(NMe2Et,OCl),ClHCl: trimeric crystals.—(NMe2Et,OCl),HCl: trimeric crystals.—(NMe2Et,OCl),H2Cl: trimeric crystals.—(NMe2Et,OCl),NCl: dimetric crystals.—(NMe2Et,OCl),N2Cl: regular crystals.—Picrate [500°] (Lossen, A. 181, 374). The ethylenedioxide is decomposed on distillation into NMe2, ethylene, and water. NMe2EtCl on distillation yields MeCl, NMe2Et, and NMe2.

Trimethylamine ethylene-triiodide NMe2EtI3 [64°]. Regular crystals (Lüdecke, A. 240, 85).

Tri-methylamine ethylene-penta-iodide NMe2EtI5 [26°]; dark-green crystals (Gouther, A. 240, 66).

Trimethylamine ethylene-enne-iodide NMe2EtI9 [38°]; black-green crystals.

Trimethylamine bromo-ethylene-bromide C,H,BrNMe2Br. From NMe and ethylene bromide at 45° (Hofmann, C. R. 47, 558). Needles, v. e. sol. hot alcohol. Ammonia as well as moist Ag2O converts it into C,H,NMe2OH.—(C,H,Br,NMe2Cl),PCl3. Octahedral crystals.—C,H,Br,NMe2I (Baeyer, A. 140, 312).

Trimethylamine iodo-ethylen-iodide C,CH,NI,NMeI. From neurine, HI, and phosphorus (Baeyer, A. 140, 309; 142, 288). Crystals, v. sol. cold water. Moist Ag2O yields C,H,NMe2OH.—(C,H,NI,NMe2Cl),PCl3; octahedral crystals.

Trimethylamine allyl-bromide C,H,Br NMe2 i.e. NMe2CH,Br. Forms a dibromide NMe2CH2Br, [176°] of which the gold salt melts at 145° (Partsch, L. 22, 8317).

Trimethylamine bromo-allyl-bromide NMe2CH2CH2CH2Br. [165°]. Formed from NMe2CH,Br, and alcoholic KO. Colourless prisms, v. sol. water and alcohol, insol. ether.
METHYLMETHOXYL KETONE

gives a perbromide NMe۵Br.CH۵Br.CHBr.CHBr۵crystallising in scales [156°].—Platinichloride (C۵Br۵NMe۵Cl)Picl. [229°].—Aurochloride C۵Br۵NMe۵AuCl. [181°].

Trimeethylamine propyl-propyl-iodide NMe۵Pr۵ICH۵CL. [151°]. From the allylo-iodide and HI at 100° (Parthell, B. 22, 3320). Colourless needles, sol. water and alcohol, insol. ether. Alcoholic KOH regenerates the allylo-compound.—(C۵H۵LNMechiCl)Picl. [229°].—Aurochloride (C۵H۵LNMechiCl)AuCl. [185°].

Trimethyamine trimethenyl bromide CH۵NMe۵Br.CH۵CH۵CH۵CH۵NH۵CMe۵NMe۵CH۵O. From the bromo-allylo-

bromide and alcoholic KOH.—Aurochloride (NMe۵CH۵Cl۵H۵)NMe۵Cl. [187°].

Dibromide NMe۵Br.CH۵CH۵Br. From the preceding and Br. Colourless, somewhat what hygroscopic crystals. Forms a platinichloride [292°] and an aurochloride [193°] both crystallising in tables.

Trimethyamine bromo-pentenyl bromide C۵H۵BrNMe۵Br. Formed from trimethyamine and di-bromo-amylene (valerylene bromide) (Ladenburg, B. 14, 231, 1843). With HI it forms C۵H۵BrNMe۵HI. Silver chloride forms C۵H۵BrNMe۵Cl, whence (C۵H۵BrNMe۵Cl)Picl and C۵H۵BrNMe۵Cl, both crystalline.

Trimethylamine isomethyl-triiodide NMe۵C۵H۵I۵L۵I۵. [80°]. From NMe۵ and C۵H۵I۵L۵(1/2) the product being treated with iodine. Dark-brown prisms, nearly insol. water, v. sol. alcohol.

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DI-METHYL-ACETAL v. ALDEHYDE.

METHYL-ISOAMYL-L-ANILINE C۵H۵NMe۵N۵H۵N۵C۵H۵. [257°]. S.G. 28 906. Obtained together with C۵H۵O۵S۵H۵ and by distilling C۵H۵NMe۵S۵H۵O۵ (Hofmann, A. 79, 15). Formed also by heating dimethylaniline with isomyl bromide (Claus a. Lautenbach, Topp. 11, 929, 1862).—C۵H۵NMe۵C۵H۵Cl۵H۵O۵, crystalline mass.—(C۵H۵)۵N۵H۵B۵H۵, 350—818 (Bohn, A. 190, 598); 8721 (Wagner, J. R. 16, 705).

Formation.—1. By heating a mixture of calcium hexacont with calcium acetate (Schmidt, B. 6, 604).—2. By the action of zinc isomyl on acetyl chloride (Grimshaw, J. R. 16, 705) by oxidising the corresponding heptyl alcohol (Grimshaw, B. 166, 160).—4. By boiling isobutyl-acet-acetic acid with aqueous KOH: the yield being 70% (Purdie, C. J. 59, 467).

Properties.—Oil. Reduced by sodium to sec-heptyl alcohol and di-isopropyl-pinacone. CrO oxidises it to acetic, isovaleric, and isohezoic acids. It combines with NaHSO۵.


Methyl amylo ketone CH۵O۵CO۵CH۵Me۵C۵H۵. (125°—130°). Obtained by oxidising the alcohol (Cochrane, B. 189, 78). Oxidised by CrO۵ to acetic acid and CO۵Me۵COH. Does not combine with NaHSO۵.

Methyl amyl ketone CH۵O۵CO۵O۵H۵. (188°). S.G. 28 817. Obtained by boiling di-ethyl-ace-
METHYL AMYL KETONE.

Acetic ether with baryta-water (Frankland and Duppa, A. 158, 212). Forms an oily compound with formaldehyde.

Methyl amyl ketone CH₃CO.C₂H₅.C₂H₅. (139°). S.G. 0.812; 41.829. Obtained by the action of ZnMe₂ on C₂H₅.CO.C₂H₅ (Wyssenrodsky, A. 178, 103). Cr₂O₃ oxidises it to H₂O₂ and C₂H₅.CO.C₂H₅.

Methyl amyl ketone CH₃CO.C₂H₅.C₂H₅. (142°-146°). From sec-heptanal alcohol derived from petroleum heptane (90°). Gives acetic acid on oxidation (Schorlemmer, A. 166, 175).


Phenyl- and hydrasides. (100°). White needles (from benzene-lycrolin).


Di-azim. (178°). Needles.


METHYL ISO-AMYL OXIDE C₂H₅.O i.e. CH₂.CO.CH₂.CH₂.CH₂.CH₂.O (92°). V.D. S.4. S.V. 149 (Schiff). From MeONa and isomyl iodide (Wagner, C. 4, 239).


METHYL AMYL DI-THTIO-CARBONATE "CO(SMe)₂(SHMe)₂ (c. 140°). From Cl.CO.SMe₂ and NaSMe (Schön, J. pr. [2] 28, 244). Liquid, smelling like CS₂. With ammonium it gives HSC₂H₅, urea, and HSMe. Alcohol potash forms K₂CO₃, methyl mercaptan, and H₂S₂Me₂.

METHYL-ANHYDRO-ACETO-BENZIL e. vol. p. 403.


Purification.—By the action of MeOH and HCl on aniline a mixture of bases is obtained. On adding dilute H₂SO₄ aniline sulphate separates, and the bases liberated from the filtrate may then be heattted with AcCl. On pouring the product into water the acetyl derivative of methyl-aniline separates in long needles, while dimethyl-aniline hydrochloride remains in solution. The acetyl derivative may be quickly saponified by boiling with conc. HClaq. (Hoffmann, B. 7, 523). The mixture of bases may also be treated with nitrous acid, whereby a diazo-benzene salt, phenyl-methyl-nitrosoamine, and nitroso-dimethyl-aniline are formed. The nitrosoamine, being insoluble in water and acids, separates as a yellow oil, and may be recrystallised from the precipitated HCl into methyl-aniline (Noelting a. Boasson, Bl. [2] 28, 2).

Properties.—Oil. Its aqueous solution is not coloured by bleaching-powder. With Na₂OBr it gives a yellow pp. (Deniges, C. R. 107, 669). With CuSO₄, it forms a compound B(CuSO₄)₂(C₂H₅)₂O (Lachowitch, M. 9, 514).

Estimation.—1. It is treated with a mixture of Ag₂O (1 vol.) and di-methyl-aniline (10 vols.), water is added after the reaction, and the solution titrated with phenol-phthalein. The dimethyl-aniline does not change the pH of the solution, and the mixture of it with the acetic anhydride keeps well (Giraud, Bl. [3] 2, 142).—2. In a mixture of aniline, methyl-aniline, and dimethyl-aniline the aniline is first determined by diazotisation and ppn. by (8)-naphthol disulphonic acid (Rt.) and NaCl. Another portion of the mixed bases (2 g.) is mixed with Ag₂O (4 g.), and, after 30 minutes water (50 c.c.) is added. The liquid is boiled to decompose the excess of Ag₂O, and the acid solution titrated with Na₂O using phenol-phthalein as indicator. The amount of Ag₂O found plus that required by the aniline previously determined is then subtracted from the amount taken, and gives a measure of the methyl-aniline present (Reverdin a. De la Harpe, B. 29, 1004).—3. In a mixture of mono- and di-methyl-aniline the amount of the former present may be shown by observing the rise of temperature on heating with an equal volume of Ag₂O.

Reactions.—1. HNO₃ gives fumes containing CO₂, and forms tetra-nitro-methyl-aniline (Van Bommel, R. T. C. 2, 81).—2. NaNO₂ added to a solution of its hydrochloride forms phenyl-methyl-nitrosoamine (C₃H₇.NMe₂.NO), a yellow oil solidifying when cooled as needles (12°-18°). It gives no reaction with gallates (De la Harpe, B. 29, 1000).—3. Boiling sulpher forms methanil-amido-phenyl-mecapto.
METHYL-ANILINE.


Thio-acetyl derivative C₆H₅CS.NPhMe. [59°]. (200°). From the acetyl derivative and sulphide of phosphorus (Wallach, B. 12, 556). Monoclinic plates (from CH₂Cl₂). Insol. water add. alkalis, sol. alcohol and ether.


Benzoyl derivative C₆H₅.NMe₂Bz. (83°). From methyl-aniline and BzO (Hepp, B. 10, 239). Formed also by heating di-methyl-aniline with benzoyl chloride at 180° (Ess, B. 13, 655). Large monoclinic crystals; insol. water, but v.


Preparation.—1. Aniline hydrobromide (or hydroiodide) is heated with (2 mols. + 10 p.p. excess of) methyl alcohol to 160° for 3 hours; the yield is 95 ° of the theoretical (Nölting a. A. Städel, B. 10, 19; cf. Lauth, Bl. 17, 448).—2. Aniline (18 pts.) saturated with HCl is mixed with a further quantity (75 pts.) of aniline and methyl alcohol (75 pts.). The mixture is heated at 230° in closed vessels until the internal pressure fails. The use of a comparatively small quantity of HCl avoids the formation of HCl and allows of the use of iron vessels. The HCl is sometimes replaced by H₂SO₄ (Schoop, Chem. Zeit. 11, 253).

Purification.—Dimethylaniline can be separated from methyl-aniline by the methods described under methyl-aniline. It can also be purified by freezing (Hübner, A. 224, 947).

Reactions. — 1. When its vapour is passed through a red-hot tube it forms benzonitrile (25° p.c.), carbazole, NH₃, benzene, and H₂O (Nietzki, B. 10, 147).—2. When heated in a current of HCl at 180° the products are MeCl and aniline (Lauth, B. 6, 677).—3. With sodium hypobromite it gives a greenish-yellow pp. in the cold and a red pp. on heating (Deniges, C. R. 107, 589).—4. Bromine (1 mol.) at 115° forms methyl-violet and napthalene bromine (Brunner a. Brandenburg, B. 11, 697).—5. By nitration with a mixture of equal volumes of ordinary conc. HNO₃ and water at 0° di-nitro-di-methyl-aniline C₆H₅(NO₂)₂.NMe₂ [4:2:1] is formed (yield 116 p.c.). If the mixture is allowed to get warm another di-nitro-di-methyl-aniline [probably 5:3:1] is formed (yield 18 p.c.). By further nitration of the first isomeride by boiling it with fuming nitric acid tri-nitro-phenyl-methyl-nitramide C₆H₅(NO₂)₃.NMe₂(NO₂) [6:4:2:1] is produced. By the same treatment the second isomeride is converted into di-nitro-phenyl-methyl-nitramide C₆H₅(NO₂)₂.NMe₂(NO₂) [5:3:1:1] (Mercus, B. 19, 2158; cf. Bormbuch, R. T. C. 2, 81). When nitrated in presence of a large excess of H₂SO₄ (30 p.p.) it yields as chief product the m-nitro-derivative whilst the p-nitro-derivative is formed in smaller quantity (Groll, B. 19, 198; Nölting, B. 19, 645).—6. Combines with chlorides with great evolution of heat forming long prisms [88°] (H. Giraud, Bl. [3] 1, 691).
METHYL-ANILINE.

Heated in sealed tube with 5 pts. of aluminium chloride for 10 hours at 250° no change is affected. Heated in air, warming layers of aluminium nitride chloride it yields a tetra-methyl benzidene (C₈H₅NO₂C₈H₅N(CH₃)₄) small needles [195°]. This base is split at 180° by action of HCl gas into methyl chloride and benzidine [118°].—7. Nitric oxide passed for 12 days into a solution of dimethylamine forms the methyl nitrate. Nitric oxide absorbed over a weak gas of the gas there are formed a faze C₂H₅N₂ [173°] and a violet colouring matter C₂H₅NO₂ (?)(Lippmann a. Lange, B. 12, 2136). 8. Nitrous acid forms nitroso-di-methyl-aniline (q. v.).—9. By heating with sulphur there is formed a compound C₂H₅NS, which is converted by HNO₂ into a base CH₃N₂O of which the nitrate is crystallisable in colourless needles and the platinoclortro B₂H₅P₂Cl₃ in plates (Mohlan a. Krohn, B. 21, 65). The compound C₂H₅NS is neither acid nor basic and appears to be CH₃N₂S. It melts at 89° and forms prisms, insol. water, and volatile with steam. On heating with sulphur it is converted into methyl amido-phenyl mercaptan.

10. Chloride of sulphur forms tetra-methyl-amido-di-phenyl disulphide (S₂C₂H₅NMe₂), (Hannomin, B. 10, 403).—11. Heated with persulphoyllic acid it gives S₂C₂H₅NMe₂, with simultaneous formation of thioyacetic acid, CS₂, H₂S, and NH₃ (Tursini, B. 17, 586).—12. Mixed with CS₂ and then treated with zinc-dust and HCl it gives tetra-methyl-amido-di-phenyl-methane [90°] and thioformaldehyde [212°] (Wiernek, B. 21, 2304).—13. Oxidising agents give rise to penta-methyl-tri-amido-tri-phenyl-carbinol (methyl violet) (o. a. E. Fischer, B. 11, 2099).—14. COCl₂ forms CO₂C₂H₅NMe₂, and, at 120°, NMe₂CO₂C₂H₅NMe₂ [15]. COCl₂ gives S₂C₂H₅NMe₂, (Hannomin, B. 10, 1689). 16. Chloroform at 230° yields CH₂C₂H₅NMe₂ (Hannomin, B. 10, 1235).—17. Chloral hydrate in presence of ZnCl₂ forms CCl₄OH.C₂H₅NMe₂, (Knöfer a. Boesneck, B. 20, 3193).—18. Furfuraldehyde in presence of zinc chloride yields C₂H₅O.C₂H₅NMe₂, which crystallises in pale-yellow needles [83°] and is a strong base (O. Fischer, A. 206, 141).—19. With hexo methyl aldehyde and ZnCl₂ it also forms a condensation-product (Auger, B. L. 2, 47, 42).—20. Benzonic aldehyde and ZnCl₂ forms C₂H₅.CH₂C₂H₅NMe₂ (O. Fischer, B. 10, 1684).—21. When treated in the cold with acetyl bromide it becomes hot and yields acetyl-tri-phenyl carbonium bromide (Staedel, B. 19, 1947).—22. Hexo toyl chloride in presence of ZnCl₂ forms a base [72-5°] (278° at 16 mm.) (Kraft, B. 19, 2997).—23. By heating with benzoyl chloride at 190°, benzoyl-methyl-aniline is formed with splitting off of MeCl (Hess, B. 10, 686; cf. Michler, B. 9, 1899).—24. Benzonic acid (B. 10, 1684) gives C₂H₅NMe₂, and di-methyl- amidobenzophenone [38°] (O. Fischer, A. 206, 88).—25. Phthalic anhydride in presence of ZnCl₂ forms di-methyl-aniline phthalaein.—26. Benzotrifluoride forms 'malschite green' (NMe₂C₂H₅,Cl₂O₂C₂H₅). The same body is formed by the action of BF₃ or BaCl₂ in presence of PO₂.———. Orthoformate and ZnCl₂ form CH₃N₂O₂Cl.——28. Vanilin and ZnCl₂ form C₂H₅NMe₂ [136°] (Fischer a. Schmidt, B. 17, 1895).—29. A blue compound is obtained by the oxidation of dimethylaniline with chloranil or other chlorinated quinone. It appears to have the same constitution whichever chloro-quinone is used, as on one region it gives a leuco-base of the formula C₂H₅N₂O₂ and melting-point [173°]. The latter forms glistening plates, sl. cold alcohol, v. sol. hot alcohol, benzene, and ether. It forms the salts: B₂H₅Cl₃: colourless crystals.—B₂H₅Cl₅P₂Cl₃: fine needles.—B₂Me₂Cl₅: crystals, sol. water, sl. sol. alcohol; with wet Ag₂O it gives an alkaline fluid (Meister, Lucius a. Brüning, B. 13, 213, 2100; Wöisch-haus, B. 14, 1953).—30. Acetone saturated with SO₂ forms (C₂H₅O)(SO₂)(NMe₂) crystal whising in lustrous plates, v. sol. water and alcohol, insol. acetone (Boesneck, B. 21, 1906). Acetone and ZnCl₂ at 150° forms C₂H₅.O.C₂H₅NMe₂ [92°] (Doehnert, B. 31). Di-methylaniline dissolved in a saturated solution of SO₂ and mixed with an aqueousolution of alloxan forms (C₂H₅N₂O₂)(NMe₂)H₂SO₄ 4aq crystallising in monolithic plates; a:b:c = 1:3399:1:3394; S = 83° 29' (Pellizzi, A. 218, 145; G. 18, 329).—32. A saturated aqueousolution of alloxan gives a compound C₂H₅N₂O₂aq crystallising in colourless needles, sl. sol. water, decomposing at 250° (Pellizzari, G. 17, 409). The compound forms a crystalline hydrochloride, nitrate, and oxalate, and yields a silver salt C₂H₅Ag₂N₂O₂. It is decomposed by alkalis forming a compound C₂H₅N₂O₂, decomposing at 261°.—33. 3-Tri-nitrobenzene forms a compound NMe₂PhC₂H₅(NO₂)(NH₂) [141°] (Heppe, A. 215, 595).—34. Tri-nitro-toluene forms a corresponding body (H₂).—35. Tri-nitro-aniline forms NMe₂PhC₂H₅(NO₂)(NH₂) [141°] (Heppe).

Sults.—Dimethylaniline is apparently less basic than aniline, for if a mixture of the bases is treated with an insufficient quantity of cold aqueous HCl the base left uncombined is chiefly dimethylaniline (Morley, C. J. 51, 580).—B₂H₅SO₄. [80°]. Sol. water, insol. ether and benzene. H.F. 8400. The normal sulphate could not be formed. At 190° the acid sulphate splits up into CO₂ and the sulphonic acid (Vignon, C. R. 107, 263)—B₂H₅H₂SO₄ [149°]. Large tables or prisms; sol. hot water and hot alcohol. Prepared by adding aqueous HgCl₂ to an alcoholic solution of dimethylaniline (Klein, B. 11, 1741).—B₂H₅OCl₂. Formed together with the proceeding. Small needles or glistering leaflets; m. P. 100°. Sol. cold water and hot alcohol, insol. cold water, v. sol. benzene. On heating to 100° a blue colouring matter is formed. —B₂H₅H₂SO₄ (Leeds, J. 1882, 504).—B₂H₅SnCl₃. Large monochlorine crystals (Hjort-dahl, J. 1882, 528).—B₂H₅P₂Cl₃ Tables. —B₂H₅PO₄, 2aq (Beinhardt a. Staedel, B. 16, 39).—B₂H₅PH₄Bromide. Bromo-di-methyl-amido-benzophenone [38°] (O. Fischer, A. 206, 88).—25. Phthalic anhydride in presence of ZnCl₂ forms di-methyl-aniline phthalaein.—26. Benzotrifluoride forms 'malschite green'
and aniline ferrocyanides (Fischer, A. 190, 184).—

B₃₃H₂₉S₈O₄ (Eisenberg, A. 205, 280).—

Methyl-anthracene. Ph₃NMe₃, Ph₃NMMe, Phenyl-trimethyl-amine. S. (alcohol) 2° 2 at 8°. The combination of Ph₃NMe₃ and Me₃ takes place rapidly (Lauth, Bl. 7, 448). It may also be obtained by shaking a mixture of aniline (1 mol.) with Me₃ (3 mol.) and KOH (2 mol.) dissolved in water (Fawinoff, J. R. 13, 448; Bl. [3] 37, 439). Plates (from alcohol). Converted by moist Ag₂O into C₆H₆NMe₂OH a deliquescent, crystalline, caustic base. When the methyl-anthracene is distilled it splits up into NMe₂Pb and Me₃, but these recombine in the receiver. It, however, a current of HCl be passed through the rotor NMe₂PbHCl condenses in the receiver, while Me₃ escapes and may be condensed in a second colder receiver (Merrill, J. pr. 217, 1896). When treated in a sealed tube with a solution of potassium in anhydrous liquefied ammonia it yields KI, NMe₂, and possibly benzene (Thompson a. Gundall, C. J. 53, 761). Boiling conc. KOH slowly decomposes Ph₃NMe₃ into dimethylketene, KI, Me₃, and MeOH (Claus a. Hauensborg, B. 14, 621). The methyl-anthracene gives rise to the following derivatives:—Ph₃NMe₂, [115°]. Brown trimeletic plates (Geuther, A. 210, 69).—Ph₃NMe₂ [87°] (Dafert, M. 4, 500). Lustrous green monoclinic needles; a: b: c = 1: 74:1: 251; β = 68° 43'.—Ph₃NMe₂ [63°]. Prismatic; thicker plates (Hjortdahl).—Ph₃NMe₂, [186°]. Needles (Hübner, A. 234, 329).—(Ph₃NMe₂)Cl; Cr₂O₆. Prisms. S. —(Ph₃NMe₂)Cr₂O₆; Monoclinic crystals (Hjortdahl).—Ethyl-anthracene EH. [128°]. Identical with methyl-ethyl-aniline-methyl-anthracene; KOH splits off dimethylamine (Claua a. Howitz, B. 17, 1332).—Ph₃NMe₂EH [81°]. Dark-violet hexagonal rhombohedra (Geuther).—Ph₃NMe₂EH [50°]. Lustrous bluish-green plates.—Ph₃NMe₂EH [45°]. Violet-black plate. (Brought—Bromo—Bromo—di—Nitro—Chloro—Bromo—Nitro—, Iodo-di—Nitro, and Nitro-di—Methylantianiline.}

DI-METHYL-ANTHACENE. Ph₃H₈V = Tetra-methyl-di-amido-di-pikynyl—pthalidume.}

METHYLANILINE SULPHONIC ACID v. METHYLANILINE SULPHONIC ACID.}

q-DIMETHYLAMINOSIDINE v. o-DIMETHYL—AMINO—PHENOL.}

METHYL-ANISOL is the methyl ether of Carbinol.}

CH₃[CH₂][CH₃,Me₂] [6° 1]. Mol. w. 192. [203°] (Börnstein); [200°] (Birukoff). Formed by distilling erythro-oxy-methyl-anthracene with zinc-dust (Birukoff, B. 20, 2070). Formed also by boiling iso-methylanthracene with zinc-dust and ammonia, and splitting off water from the resulting methyl-hydroxanthanol by boiling with xylene (Börnstein, B. 15, 1821). White plates.—B₃₃C₉H₄(NO₃)₂OH: red needles. Gives 90% oxidation methyl-anthraquinone [167°] and the corresponding anthraquinone carboxylic acid. Forms a di-bromo-methyl-anthracene [145°].


(B. 2). Methyl-anthracene C₆H₅[CH₃,Me₂] [6° 2]. [200°]. Occurs in coal-tar oil, and hence is present in crude anthracene and phenanthrene (Japp a. Schultz, B. 10, 1049).

Formation.—1. By passing di-tolyl-methane through a red-hot tube (Weiler, B. 7, 1181).—2. By passing dibutyl-ethane through a red-hot tube (O. Fischer, B. 7, 1191; 8, 675).—3. Apparently occurs among the products obtained by passing vapour of oil of turpentine through a red-hot tube (Schultz, B. 10, 84).—4. By the action of zinc-dust at high temperatures on chrysophanic acid C₆H₄(OH)₂, on emodin C₆H₅OH(OH), on aloin in small quantity (E. Schmidt, B. 8, 1275; Ar. Ph. [3] 8, 490), on the acid [4:1]CH₃COCH₃CHO, C₆H₅COCH₃G (Gresly, A. 234, 238), on abiotic acid (colophony), on gum benzoin (Clamician, B. 11, 273), on ephrharhine (Liebmann a. Seiler, A. 212, 84), and on methyl-quinizarin (Nietzki, B. 10, 2015).—5. By boiling phenyl xylyl ketone C₆H₅C₆H₅CO, C₆H₅CO,H₄F [2:2:4] for a long time (Elbs, J. pr. [3] 25, 430). The isomer C₆H₅C₆H₅CO, C₆H₅CO,H₄F [1:2:5] condenses on boiling to the extent of 10 to 20 p.c. to (B. 2)-methylanthracene; dehydrating agents either stop the reaction or split off benzoic acid.

Properties.—Yellowish plates (from alcohol). Sublimes in large white plates, exhibiting blue fluorescence. Sl. sol. alcohol, ether, and H₂SO₄, v. sol. CH₃CO, benzene, and CS₄. Chromic acid in H₂O oxidises it to anthraquinone carboxylic acid [282°]. Conc. HNO₃ added to its alcoholic solution forms methyl-anthraquinone. Bromine in CS₄ forms a di-bromo-derivative [186°] (Fischer), which yields, on further bromination, a tetra-bromo-derivative crystallising from toluene in needles. The picric acid compound melts at [93°] (Gresly).

Di-methyl-anthracene C₆H₅, [71°]. (above 360°). V.D.

Di-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4 \text{Me}_2 \) [210°]. One of the products of the passage of benzyl-mesitylene through a red-hot tube (Lounis, Br. [2] 44, 476). Rhomboïdal plates, insoln. cold alcohol, sol. ether, ligroin, and acetic acid, v. sol. hot benzene and toluene. Forms small colourless leaflets when sublimed. Br. in \( \text{CS}_2 \) forms a crystallised bromo-derivative. The picric acid compound crystallises in red needles. \( \text{CrO}_3 \) in \( \text{H}_2\text{O} \) oxidises it to di-methyl-anthraquinone [112°]. Forms a green compound with nitro-anthraquinone.

Di-methyl-anthraquinone

\[
\text{CH}_2\text{O}_4\text{Me}_2 [6:4 \; 2:4] \text{?} \quad [220°-226°].
\]

Obtained by distilling with zinc-dust the tri-oxal-di-methyl-anthraquinone derived from \( m \)-xylene carboxylic acid, gallic acid, and \( \text{H}_2\text{SO}_4 \) (Hurkoff, B. 20, 871). Plates. Oxidised by \( \text{CrO}_3 \) to a di-methyl-anthraquinone [112°].

Di-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_2 \) [215°]. Obtained by treating a mixture of toluene (8 pts.), \( \text{CS}_2 \) (9 pts.), and chloroform (1 pt.) with \( \text{AlCl}_3 \) (2 pts.) (Elbs \& Wittich, B. 18, 348). With chromic acid it gives a quinone [162°]. Probably identical with the isomeride [210°].

Di-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_2 \) [290°]. From \( \text{CH}_3\text{MeCOCH}_3\text{H}_2\text{O}_2 \) by heating with red-hot zinc-dust (Greasy, A. 294, 238). Plates. Possibly identical with the isomeride [220°-226°].

Di-methyl-anthraquinone

\[
\text{CH}_2\text{O}_4\text{Me}_2 [1:6 \; 2:4] \text{?} \quad [245°].
\]

Formed by the reduction of di-methyl-anthraquinone [185°] with zinc-dust and \( \text{NH}_3 \). White plates, with bluish-green fluorescence. Its picrate forms garnet-red needles, decomposed by alcohol (Elbs \& Euriich, B. 20, 1363).

Di-methyl-anthraquinone

\[
\text{CH}_3\text{MeCOCH}_3\text{H}_2\text{O}_2 \text{Me}_2 \quad [225°] \text{A.} ; [222°] \text{F.}
\]


Scales. With \( \text{CrO}_3 \) in \( \text{H}_2\text{O} \) it gives dimethyl-anthraquinone [169°], which forms an orange

solution in \( \text{H}_2\text{SO}_4 \). The picric acid compound crystallises in slender needles.

Di-methyl-anthraquinone

\[
\text{CH}_2\text{O}_4\text{Me}_2 \quad [244°].
\]

From tetra-methyl-anthraquinone dicyhride, \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_2 \text{CMe}_2 \text{H}_2 \text{Me} \) by distillation over red-hot zinc-dust (Anschütz, A. 235, 320).

Greenish-yellow laminae (from benzene); m. sol. bennson, sol. ether, alcohol. Gives on oxidation di-methyl-anthraquinone [230°]

\[
\text{CH}_2\text{O}_4\text{Me}_2 \text{CMe}_2 \text{H}_2 \text{Me} \quad [181°].
\]

From ethylidene bromide, benzene, and \( \text{AlCl}_3 \) (Anschütz, A. 235, 305). Yellow laminae (from alcohol). Sublimes in yellow yegles. V. sol. bennson, sol. ether, sol. cold alcohol and glacial \( \text{H}_2\text{O} \). Distillation over red-hot zinc-dust gives anthra- cene. Oxidation gives anthraquinone. Bromine in \( \text{H}_2\text{O} \) gives \( \text{CH}_2\text{O}_4\text{Me}_2 \text{Br}_2 \text{Me} \text{CMeBr} \text{H}_2 \text{Me} \), which crystallises from toluene in needles.

\[
\text{CH}_2\text{O}_4\text{Me}_2 \text{CMeBr}_2 \text{H}_2 \text{Me} \quad [250°].
\]

White crystals, sol. ether, benzene, and \( \text{H}_2\text{O} \).

Di-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_2 \) [1:6:2:2:5] [236°] (W.); [243°] (G.). Obtained by distilling 'p-phenetidine-pthalaleric' acid \( \text{CH}_3\text{MeCOCH}_3\text{H}_2\text{O}_2 \) with zinc-dust (Greasy, A. 234, 229). Formed also by distilling tri-oxal-di-methyl-anthraquinone [244°] over zinc-dust (Wende, B. 20, 605). Exhibits green fluores- cence.

Di-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_2 \) [2:5:1] [233°] [237°].

Formed by boiling di-p-xylyl-ketone \( \text{CH}_3\text{MeCOCH}_3\text{H}_2\text{O}_2 \) for six hours, \( \text{H}_2\text{O} \) being eliminated. Colourless plates, with bluish-green fluorescence. Sublimes below 100°, slightly volatile with alcohol. V. sol. cold alcohol, sol. ether. By \( \text{CrO}_3 \) and acetic acid it is reduced to tri-methyl-anthraquinone [184°] (Elbs \& Olbern, B. 19, 409; J. pr. [2] 85, 465).

Tetra-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_4 \) [ca. 280°].

A small quantity ('3 g) is formed from \( m \)-xylene (100 g); \( \text{AlCl}_3 \) and acetylene tetra-bromide (Anschütz, A. 235, 179). \( \text{CrO}_3 \) gives a substance (tetra-methyl-anthraquinone?) which forms needles (ca. 300°).

Tetra-methyl-anthraquinone (7). [280°].

From \( m \)-xylene, \( \text{AlCl}_3 \), and acetylene tetra-bromide (Anschütz, A. 235, 179). Fluorescent needles.

Tetra-methyl-anthraquinone (7). [280°].

Formed similarly from \( p \)-xylene (A.).

Tetra-methyl-anthraquinone \( \text{C}_9\text{H}_6\text{O}_4\text{Me}_4 \) [158°].

Forms a solution of methyl ether chloride in presence of \( \text{AlCl}_3 \) on \( m \)-xylene, and in smaller
**METHYL-ANTHRAQUINONE.**

3629


Tetra-methyl-anthracene dibromide

\[ \text{C₉H₆Me} \text{CBr₂Me} \text{C₉H₆Me} \]

From the corresponding tetra-methyl-anthracene dihydride by bromaninination (Aaschütz, A. 235, 321). Yellow needles; decomposes when heated.

Tetra-methyl-anthracene dibromide

\[ \text{C₉MeH₂} \text{CBr₂Me} \text{C₉MeH₂} \]

[171°]. Obtained by the action of ethylidene chloride on toluene in presence of AlCl₃ (Aaschütz, A. 235, 317). Pale-yellow tritomic laminae; \( \alpha \beta = 675:1:924 \) (from alcohol and HOAc); v. sci. benzene, sl. sol. HOAc, v. sl. sol. alcohol. Distillation over red-hot zinc dust gives di-methyl-anthracene [241°]. Oxidation gives di- methyl-anthraquinone [238°].

\[ \text{C₉H₂C₆H₄(NO₃)} \text{O}_2 \]

[165°]. Red, crystal-like needles.

Hexa-methylanthracene C₉H₂Mo₃ [c. 220°].

One of the products of the action of methyl chloride on ψ-cumene in presence of AlCl₃ (Friedel et al. Crafts, A. Ch. [6], 11, 272). Not volatile at 440°. The alcoholic solution gives with picric acid a brownish-black pp. [203°]. Conco. H₂SO₄ forms a red solution, becoming colourless on absorbing moisture.

References.—DI-BROMO-METHYL-ANTHRACENE and AMIDO-METHYL-ANTHRACENE DIHYDROIDE and DIBROMIDE.

DI-METHYL-ANTHRACRYLONE et TETA- 

OXY-DI-METHYL-ANTHRACONE.

DI-METHYL-ANTHRACYL-AMINE et DI- 

METHYL-ANTHRACYCLAMINE.

DI-METHYL-ANTHRALFLAVIC ACID et DI- 

METHYL-ANTHRALFLAVOLS et 1:2:3-TRI- 

METHYL-ANTHRALFLAVONE.

DI-METHYL-ANTHRANILAMINE C₉H₆Mo₃ Me₃ DI-methyl-anthranilamine [155°]. Formed by heating the methyl-hydralde. Thin golden plates. Soluble in alcohol with a green fluorescence.

Salts.—B₂H₂Cl: colourless plates, decomposed by water. B₂H₂Cl₂PtCl₄: yellow pp.

Methyl chloride B₂MCl₂ [215° uncr.]. Formed by heating anthranil with methyl iodide at 100°. Flat needles, sol. hot water, sl. sol. cold, nearly insol. alcohol.

Methylo-chloride-platinum salt B₂Me₂Cl₂P₂Cl₄: yellow crystalline pp.

Methylo-hydralde B₂Me₂(OH): strongly alkaline. Formed by the action of Ag₂O on the iodide; on boiling the aqueous solution it decomposes into di-methyl-anthranil and methyl alcohol (Bollert, B. 16, 1630).

METHYL-ANTHRANILIC ACID et AMIDO- 

ZOLIO ACID.

(183°).

Obtained by heating o-xylol-phenyl-phenol-carboxylic acid (o-xylol-o-benzolic acid) with concc. H₂SO₄. By HNO₃ (S.G. 1.2) at 220° it is oxidized to anthranilic acid [384°] (Elba et al. Erich, B. 20, 1361).

DI-METHYL-ANTHRANILACETONE

\[ \text{C₉H₂CH₆O₃ \text{C₉H₆Me}} \text{C₉H₆Me} \text{[1:3:4]} \]

[183°].

Obtained by heating m-xylol-phenyl-phenol-carboxylic acid (m-xylol-o-benzolic acid) with conc. H₂SO₄; the yield is 60 to 70 p.c. of the theoretical (Gresly, A. 284, 240; Elba et al. Günther, B. 20, 1864). Small needles, sl. sol. benzene.
and alcohol. By dil. HNO₃, it is oxidized to anthraquinone m-di-carboxylic acid [above 530°]. Reduced by zinc-dust and ammonia to a hydrocarbon [285°] which forms with picric acid reddish-brown scales [135°].

**Di-methyl-anthraquinone**

\[ CH₂<CO>CH₃; \] \([0.2:5] \). [118°]. Formed by warming [4:1:2:2] CO, H₂, Me, CO, C, H₂, CO, H. \(\times 2 \): 1 with conc. H₂SO₄ at 120° (Gresly, A. 234, 240).

**Di-methyl-anthraquinone**


**Di-methyl-anthraquinone**


**Di-methyl-anthraquinone**


**Di-methyl-anthraquinone**


**Di-methyl-anthraquinone**

\[ C₃H₆<CO>CH₃; \] \([1:2:4] \). [107°]. Obtained by oxidizing the di-methyl-antracene, formed from tolenc, methylene chloride, and AlCl₃ (Friedel a. Crafts, A. C. 6, 11, 266). Forms an orange solution in H₂SO₄. Probably identical with the preceding.

**Tri-methyl-anthraquinone**

\[ C₃H₆<CO>CH₃; \] \([1:2:4] \). [107°]. Formed by warming \(\psi\)-cinnolin-benzene acid CO, Me, CO, H, CH₃, CO, Me, CH₃ for a short time with conc. H₂SO₄ (Gresly, A. 234, 210). Needles.

**Tri-methyl-anthraquinone**


**References.** — Amido-, Nitro-, and Oxy-methyl-anthraquinones.

**METHYL-ANTHRAQUINOINE CARBOXY.**

**LUCIDIC C₃H₆O₂; i.e., C₃H₆<CO>CH₃; CH₃<CO>CH₃, CO, H.** \([94°] \). Occurs among the products of the oxidation of coal-tar di-methyl-antracene by Cr₂O₃ in HOAc (Wachendorff a. Zinke, P. 10, 1483). Small needles (by sublimation); v. sol. hot alcohol.

**Di-methyl-anthraquinone carboxylic acid C₃H₆O₂; i.e., C₃H₆<CO>CH₃; CO, CH₃, CO, H.** \([240°] \). Formed by heating \(\psi\)-cinnolin-benzene acid CO, CH₃, CO, CH₃, CO, H, CH₃, CO, H at 234° (Gresly, A. 234, 241). Small needles. V. sol.

**alkalis, sl. sol. alcohol and benzene. May be sublimed.**

**DI-METHYL-ANTHRAABUNIN v. DI-oxi-di-methyl-anthraquinone.**

**DI-METHYL-ANTHRONE C₃H₆O₂; i.e., C₃H₆<CO>CH₃; CH₃<CO>CH₃, CO, H.** \([94°] \). Formed by the action of Me and KOH in on anthranol (Haller, H. 23, 2508). Transparent crystals, v. sol. benzene, ether, sl. sol. petroleum ether. Converted by the action of HI and red phosphorus into di-methyl-antracene dihydroxide.

**METHYL-ABRBUTIN v. ABREUTIN.**


**METHYL ARSENITE Me₃AsO₄.** \([129°] \). S. G. 3.4–1428. V. D. 6–01. From As₂O₃ and NaOMe (Crafts, HII. [2] 14, 104). When arsenic n. is dissolved in aqueous NaOH and treated with alcoholic Me the product is not monomethyl arsenite but methane arsenic acid CH₃AsO(OH)₂ (Klinger, A. 249, 149; cf. vol. 1. p. 317).

**METHYL-ABRINE v. Organic Aromatic compounds.**

**METHYL-ATRALIC ACID v. OXY-TOLYLPROPYRIC ACID.**

**METHYL-ATROPIC ACID v. PHENYL-CROTONIC ACID.**

**METHYL-AURIN C₂₀H₁₈O₃ ag. A by-product in the preparation of aurin (Zieukowski, A. 194, 131; 202, 210; M. 3, 476). Brick-red crystals with green lustre (from 60 p.c. alcohol). Its alcoholic solution is yellowish-red, and becomes crimson on addition of alkalis. It loses ag at 110°, but does not melt below 200°. HCl added to its dilute alcoholic solution ppts. C₂₀H₁₈O₃, as red crystals with blue reflex. On heating with water in sealed tubes at 245° methyl-aurin is split up into p-cresol and di-oxy-benzenophene. Alkaline KMnO₄ oxidizes methyl-aurin to C₂₀H₁₈O₃. Potash-fusion forms p-oxo-benzoic acid. Zinc-dust and HOAc reduce it to methyl-1-1-methylaurin C₂₀H₁₈O₃, which crystallises in long colourless needles. H₂SO₄ forms red crystals of (C₂₀H₈O₃)₃, H₂SO₄, and which are blue by reflected light. Bromine in HOAc forms crystals of C₂₀H₁₈Br₂O₂HBr ag, which have a steel-blue reflex.**

**METHYL-ASELAIC ACID v. OCTANE DI-CARBOXYLIC ACID.**

**METHYL-DIAZO-COMPOUNDS v. DI-azo-compounds.**

**TETRA-METHYL-TETRAZONE C₆H₄N₂, i.e., (CH₄)₄N₄N(NC₄H₄)₂** \([135°] \). Prepared by the oxidation of dimethyl-hydrazine in etheral solution with H₂O (Hennouf, B. 13, 2173). Oily fluid. Explodes with violence if heated above 130°. Alkaline in reaction. Reduces AgNO₃ to a silver mirror. It is decomposed by boiling aqueous acids into dimethylamine, methylamine, formic acid, and nitrogen.

**SALTS.** — The picrate B₃C₂H₁₈(NO₃)₂, OH forms yellow prisms. V. sol. water, sl. sol. alcohol. The other salts are also easily soluble in water.

**METHYL-is-Barbituric ACID C₆H₄O₃.** Formed by treating nitro-methyl-uracil
METHYL-BENZENE

SULPHONIC ACID.

\[
\text{CO} - \text{NMe}_2 \cdot \text{CH} - \text{NO}_2 \text{ with } \text{HCl (Lehmann, A. 253, 80). Needles, v. sol. cold water. Di-methyl-benzoic acid from Di-methyl derivatives of Bishinmide \text{CH}_2 = \text{N} \cdot \text{H} \cdot \text{Me, Mol. w. 148. } [52^\circ]. } \]

\[
\text{NMe}_2 \cdot \text{CH} = \cdot \text{NO}_2 \text{, V.D. 5-27 (calcd. 5-12). H.F. 31,000, H.C. 1,554,100 (Stohmann, } \]

\[
\text{Kleber, a. Langbein, J. pr. [2] 40, 83). One of the products of the action of } \text{MeCl on benzene } \]

\[
\text{or toluene in presence of } \text{AlCl}_3 (\text{Friedel a. Crafts, A. Ch. [6] 1, 472; Ador a. Rilliet \& B. 12, 393). Formed also in like manner from action of } \text{MeCl and AlCl}_3 \text{ on tri-methyl-benzene at } 100^\circ - \]

\[
110^\circ; \text{the fraction } (230^\circ - 235^\circ) \text{ on crystallisation from alcohol deposits } \text{C}_6\text{H}_5\text{Me, first, and the penta-}
\]

\[
\text{methyl-benzene remaining in the mother-liquor may then be purified by means of its sulphamide } \text{(Jacobsen, B. 20, 998). } \]

\[
\text{Penta-methyl-benzene is a by-product in the formation of tetra-methyl-benzene by the action of } \text{Me and AlCl}_3 \text{ on } \psi-\text{cumene (Claud, J. pr. [2] 38, 231).} \]

\[
\text{Properties. — Flat prisms; v. o. sol. alcohol.} \]

\[
\text{Reactions. — 1. Bromine in CHCl, forms } \text{C}_6\text{H}_5\text{Br. } [163^\circ]. \text{I.V. (F. a. C.) Jacobson, B. 20, 998]. } \]

\[
2. \text{AgNO}_3 \text{ and vapour of Br forms } \text{di-bromo-c-durene } [203^\circ]. \text{Gottschalk, B. 20, 3388}. \]

\[
3. \text{CISO}_2\text{H forms the sulphene and sulphochloride (Jacobsen). — 4. Cold conc. H}_2\text{SO}_4 \text{ does not form the corresponding sulphonic acid, but yields } \text{c-tetra-methyl-benzene sulphonie acid and hexa-methyl-benzene } \text{(J.).} \]

\[
5. \text{K}_2\text{MnO}_4 \text{forms benzene penta-carboxylic acid (F. a. C.). — 6. Fuming nitric acid forms } \text{di-nitro-c-tetra-methyl-benzene } [178^\circ] \text{(Gottschalk, B. 20, 3267). Dinitre nitric acid acting on its solution in benzene produces tetra-methyl-benzene acid } [165^\circ]. \text{ — 7. Heating with } \text{AlCl}_3 \text{ forms isourene, } \text{C}_6\text{H}_5\text{Me, and other hydrocarbons (Jacobsen, B. 18, 340). } \]

\[
8. \text{CISO}_2\text{H and AlCl, convert } \text{C}_6\text{H}_5\text{Me, dissolved in CS, into the amide of penta-methyl-benzene acid (Jacobsen, B. 22, 1210). } \]

\[
\text{Picric acid compound } \text{C}_6\text{H}_5\text{Me}_2 \cdot \text{CH}_2 \cdot \text{NO}_3 \cdot \text{OH. } [169^\circ]. \text{Golden plates.} \]

\[
\text{METHYL-BENZENE CARBOXYLIC ACID.} \]

TOLUIC ACID.

\[
\text{Di-methyl-benzene carboxylic acid v. Methylenic and Di-methyl-benzonic acids. } \]

\[
\text{Tri-methyl-benzene carboxylic acid v. } \psi-\text{Cumic acid.} \]

\[
\text{Methyl-benzene dicarboxylic acid v. Utrio acid, Methy1-isophthalic acid, Methy1-tetraphthalic acid, and Toluene dicarboxylic acid. } \]

\[
\text{Di-methyl-benzene dicarboxylic acid v. Di-methyl-isophthalic acid and Di-methyl-tetraphthalic acid. } \]

\[
\text{Tri-methyl-benzene dicarboxylic acid } \text{C}_6\text{H}_5\text{Me}_2 \cdot \text{CO} \cdot \text{H}. \text{Obtained by oxidising } \text{C}_6\text{H}_5\text{Me}_2 \cdot \text{CO} \cdot \text{H}_2 \text{ with } \text{K}_2\text{MnO}_4 \text{ in alkaline solution (Ador a. Mayer, J. 1879, 562). Needles (from water). — Ba}_2\text{Acq. Blende needles; almost insol. water.} \]

\[
\text{Tetra-methyl-benzene dicarboxylic acid } \text{C}_6\text{H}_5\text{Me}_2 \cdot \text{CO} \cdot \text{H}_2 \text{ [6:5:4:3:2:1]. } [249^\circ]. \text{ Formed by boiling } \text{C}_6\text{H}_5\text{Me, with dilute } \text{HNO}_3 (\text{Jacobsen, B. 22, 1215). Small needles (from hot water) or prisms (from alcohol). Yields e-durene when distilled with lime. — Ba}_2\text{Acq. Dia-}
\]

\[
\text{METHYL-BENZENE Sulphonic Acid v. Toluene sulphonic acid. } \]

\[
\text{Tri-methyl-benzene sulphonic acid } \text{C}_6\text{H}_5\text{Me}_2 \cdot \text{SO}_3\text{H [1:3:4:6]. } [98^\circ]. \text{ Long needles (from water). — Na}_2\text{Ba}_2\text{. S. 5 at } 7^\circ. \text{ Thin plates. — Ag}_2\text{Ba (Radiof. B. 11, 83).} \]

\[
\text{METHYL-BENZENE Sulphonic Acid v. Toluene sulphonic acid.} \]
METHYL-BENZENE SULPHONIC ACID.

Di-methyl-benzene sulphonic acid v. XYLENE SULPHONIC ACID.

c-Tri-methyl-benzene sulphonic acid

C₈H₇Me₂CO₂H [123-8-5]. Heminellitine sulphonic acid. Formed by sulphonation of heminellite (Jacobsen, B. 15, 1858; 19, 2517). Crystallises from dilute H₂SO₄ in six-sided plates or tablets (containing aq.)—NaA': tablets; v. sol. hot, m. sol. cold, water.—"Ba' : brittle plates, v. sl. sol. water.

Chloride C₈H₇Me₂CO₂Cl. [1967]. Prisms or needles. Less soluble in alcohol than the amide of ψ-cumene sulphonic acid.

Isomerides v. ψ-CUMENE SULPHONIC ACID and

METHYLENE SULPHONIC ACID.

Tetra-methyl-benzene sulphonic acid v. DURENE SULPHONIC ACID.

Penta-methyl-benzene sulphonic acid

C₉H₇Me₅SO₃H. Obtained by treating penta-methylbenzene with CISO₄ and H₂SO₄ and treating the product with NaOH to convert the C₈H₇Me₅CO₂Na first formed into C₈H₇Me₅SO₄Na (Jacobsen, B. 20, 899). In the action of CISO₄ on C₈H₇Me₅H a sulphocarboxylic acid (785°) is formed, from which penta-methylbenzene carboxylic acid is also formed. The free acid, liberated by shaking the sodium salt with light petroleum and H₂SO₄ at once undergoes hydrolysis, C₈H₇Me₅H dissolving in the petroleum.

Salts.—A'Na: tablets (from neutral aqueous solution) or plates (from hot, dilute, NaOH); sl. sol. cold water, m. sol. hot water, insol. cold, dilute NaOH.—A'K: plates (from hot water).—A'Ba: plates, v. sl. sol. hot water.—A'Ca: plates.—A'Ag: plates, v. sl. sol. cold, m. sol. hot, water.—A'C: greenish-white tablets; sl. sol. water.

Chloride. [825°]. Plates (from EtOH) or prisms (from Et₂O); v. sol. EtOH and Et₂O.

Amide. [156°]. Prisms; v. et sol. hot, m. sol. cold, EtOH; insol. water. KMnO₄ produces a sulphamic acid [c. 265°].

METHYL-BENZLOGOCYAMIDINE v. BENCHEERATIN.

e-METHYL-BENZLOGOCYAMINE v. BENCHEERATIN.

TETRA-METHYL-BENZIDINE v. TETRA-METHYL-DI-P-AMIDO-DIPHENYL.

METHYL-BENZIL v. PHENYL TOLU TOLY DIKETONES.

METHYL-BENZOIC ACID v.トル酸 ACID.


Di-methyl-benzilic acid

C₉H₇Me₂CO₂H [4:2:1]. m-Xylene i-carboxylic acid. Xylyllic acid. Xylic acid. [126°].

(267°) at 727 mm.


Salts.—Ca'Ag; monoclinic prisms, v. sol. water.—Ba'Ca'Ag.—Ag'.

Chloride C₈H₇Me₂CO₂Cl. [25°]. By passing COCl₂ into m-xylene containing AlCl₃, and heating to 100° (Ador a. Meyer, B. 12, 1968).

Amide C₈H₇Me₂CONH₂. [180°]. Formed by warming the nitrile with H₂SO₄ (85° p.c.). Formed also by the action of NH₄ClO₄ on m-xylene in presence of AlCl₃ (Gattermann, A. 214, 53). Formed also by passing gaseous HONO and HCl gas into m-xylene containing AlCl₃ on the water-bath (Gattermann a. Rossolomo, B. 23, 1196). Long shining needles (from water). Almost insol. cold water, v. sol. alcohol.

Amide C₈H₇Me₂CONHPh. [188°]. Crystals, v. sol. hot water.


Nitrite C₈H₇Me₂CN. [25°]. (21°). S.G. 1.9871 (Hinrichsen, B. 21, 3092). V.D. 4.64. Formation.—1. By heating the formyl derivative of m-xylidene with zinc-dust; the yield being about 12 p.c. (Gasiorowski a. Mers, B. 18, 1012).—2. By dissolving the corresponding PO(C₈H₇Me₂), with KCl; the yield being 15 p.c. (Kreysa, B. 18, 1713).—3. From m-xylidine by Saulnier's reaction (Birnko, B. 20, 871). Properties.—Triclinic crystals (from dilute alcohol). Volatile with steam. Yields benzyldi-methylamine on reduction.

Amidoamin C₈H₇Me₂C(NH₂)NHOEt which crystallises in white needles, [173°], v. sol. alcohol, ether, chloroform, benzene, and boiling water, sl. sol. cold water. Excess of HCl converts the ethyl derivative into C₈H₇Me₂CClNHOEt, a yellow aromatic oil.—2. Chloral forms a compound CO₃Cl₂CO(C₈H₇Me₂C(NH₂)NHOH) [112°] crystallising in white scales, v. sol. alcohol and ether but decomposed by water and dilute acids. 3. CICO₂Et acting on the amidoamin in chloroform forms C₈H₇Me₂C(NH₂)NOCO₂Et [148°] which crystallises in white needles, v. sol. alcohol, ether, chloroform, sl. sol. ligroin. It is converted by heat into C₈H₇Me₂C(OH)₃CO which crystallises in needles [182°], v. sol. alcohol and ether.—4. Potassium cyanate acting on the hydrochloride of the amidoamin forms C₈H₇Me₂C(NHOH)NOCO₂Et [158°] which crystallises from dilute alcohol in white needles, and forms an unstable platinochloridic acid.

5. Phenyl cyanate at 100° reacts forming...
METHYL-BENOZOIC ACID.

O$_7$H$_4$Me$_2$(NOH)$_2$HNCO.NHPh [189°] which crystallises from alcohol in light-yellow scales, sol. acids, alcohol, ether, chloroform, benzene, and hot water. 6. Phenyl thio-carbimide at 100° forms C$_7$H$_5$Me$_2$(NOH)$_2$HNCO.NHPh [150°], sol. alcohol, ether, benzene, boiling water, and acids. 7. Heating with Ag$_2$O forms the azoim C$_7$H$_5$Me$_2$(NOH)CO.CH$_2$ [389°].

8. Succinic anhydride forms the azoim C$_7$H$_5$Me$_2$(NOH)C$(\text{NO})$O.CH$_2$.CO.H which forms long white needles, [112°], v. sol. alcohol, ether, benzene, CHCl$_3$, and hot water, and yields crystal-line salts.

Acetyl derivative of the amidozin C$_7$H$_5$Me$_2$(NOAc)NH$_2$. 159°. Small white needles, v. sol. alcohol and chloroform, sl. sol. ether (Oppenheimer, B. 22, 2445).

Benzoyl derivative of the amidozin C$_7$H$_5$Me$_2$(NOH)BCl$_2$. 159°. White crystals, v. sol. alcohol, ether, and chloroform, sl. sol. water and ligroine. Converted by heat into C$_7$H$_5$Me$_2$(NOH)BCl$_2$.CO.CH$_2$.NH$_2$. which crystallises in faintly yellow scales, v. sol. alcohol, ether, and chloroform, volatile with steam (Oppenheimer, B. 22, 2445).

Di-methyl-benzoic acid C$_7$H$_5$Me$_2$.CO.H [5:3:2:1].

p-Xylene carboxylic acid. [152°]. (206° i.V.)

Formation. 1. From bromo-p-xylene by treatment with CICOEt and alkali-amalgam, the resulting ether being then saponified (Jacobson, B. 14, 2111). 2. By oxidation of methyl xylol ketone CH$_3$.CO.C.H$_5$.Me$_2$ by dilute HNO$_3$ or by KMnO$_4$ (Claus, B. 19, 1858; 19, 8185).—3. From its amide.


Salt. — C$_7$H$_5$Me$_2$.CO$_2$.Na. 2aq: crusts, m. sol. water. 3aq: small needles. Amide C$_7$H$_5$Me$_2$.CONH$_2$. 186°. Formed by the action of CH$_3$.CO.NH$_2$. (or of HNCO and HCl) on C$_7$H$_5$.CONH$_2$ (Gattermann, A. 244, 64; B. 23, 1199). Colourless needles (from water); m. sol. hot water; v. e. sol. alcohol.

Di-methyl-benzoic acid C$_7$H$_5$Me$_2$.CO.H [3:2:1].


Di-methyl-benzoic acid C$_7$H$_5$.Me$_2$.CO.H [4:3:1].


Amide C$_7$H$_5$.Me$_2$.CONH$_2$. [181°]. Formed by the action of NH$_2$.CO.Cl on o-xylene in presence of AICI$_3$ (Gattermann, A. 244, 59). Long shining needles (from water). The amide obtained from o-xylene, gaseous cyanic acid, HCl, and AICI$_3$ melts at 185° (Gattermann a. Rossolomy, B. 23, 1199).


Nitro C$_7$H$_5$.Me$_2$.CN. [232°]. V.D. 4:61. Formed by fusing potassium o-xylene sulphonate with KCl (Jacobson, B. 11, 23). Formed also by heating the corresponding xyloglyl phosphate PO(C$_7$H$_5$.Me$_2$), with KCl, the yield being 50 per cent. (Kreyssler, B. 18, 1711). Liquid, miscible with alcohol and ether.

Di-methyl-benzoic acid C$_7$H$_5$.Me$_2$.CO.H [5:3:1] is described as Mesityleneic acid.

Di-methyl-benzoic acid C$_7$H$_5$.Me$_2$.CO.H?


Tri-methyl-benzoic acid v. 4-CUMICACID.

Another tri-methyl-benzoic acid, Hemimellithec carboxylic acid, is described as c-CUMICACID.

Tetra-methyl-benzoic acid C$_7$H$_5$.Me$_2$.CO.H$_2$ [5:3:2:1]. [165°] (G.); [150°] (C.). (c. 270°). Formed by oxidising pronta-methyl-benzene, dissolved in benzene, with dilute nitric acid (Gottschalk, B. 20, 3286). Formed also by oxidising tetra-methyl-phenyl methyl ketone or tetramethyl-phenyl-acetic acid with KMnO$_4$ (Claus, J. pr. 28, 324). Needles (G.), m. sol. hot water, v. e. sol. alcohol, ether, benzene, CS., and chloroform (C.). Its alkaline salts are very soluble. The Ag salt is v. al. sol. water. The cupric salt forms light-green plates. — Ba$_2$.aq. Plates or nodules, v. sol. water and alcohol (G.). — Ba$_2$.aq. 6aq (C.). — C$_7$H$_5$.aq (C.). — Na$_2$.aq. 3aq.

Tetra-methyl-benzoic acid C$_7$H$_5$.Me$_2$.CO.H [6:4:3:2:1]. Formed by oxidising the corresponding C$_7$H$_5$.Me$_2$.CO.H with KMnO$_4$ (Claus a. Fecking, B. 20, 8103). Yellow liquid, not solidified at 0°.


Amide C$_7$H$_5$.Me$_2$.CONH$_2$. [173°]. From durene, CICONH$_2$. and AICI$_3$ (Gattermann, A. 244, 55). Shining plates (from dilute alcohol).

Tetra-methyl-benzoic acid C$_7$H$_5$.Me$_2$.CO.H [179°]. From durene, CICONH$_2$. and AICI$_3$. The product being decomposed by water (Jacobson, B. 22, 1223). Also from C$_7$H$_5$.Me$_2$.CO.CH$_3$. and KMnO$_4$ (Meyer a. Ador, J. 1879, 523). Must be identical with one of the three preceding acids.
METHYL-BENZOIC ACID.

probably with that of Gottschalk. Large plates (from dilute alcohol), v. sol. cold water. Volatile with steam. May be distilled. Conc. HClaq at 210° yields durene and CO₂—Ca₄’. Short prisms, sl. sol. hot water—Ba₄’. Sugar. Small plates (from hot water).

**Methyl ether** C₆H₅Me₂CO₂Me. [69°]. (209° i.V.). Plates (Jacobsen, B. 22, 1229). Saponified by alcoholic potash at 210°.

**Nitrile** C₆H₅Me₂CN. [77°]. Formed by distilling tetra-methyl-benzene acid with PbCr₂O₇ (Jacobsen, B. 22, 1224). Needles, v. sol. alcoh. Split up by HCl at 215° into durene and CO₂. A crystalline nitrile C₆H₅CN [69°]. (260°), probably identical with the last is formed by the isomeric change of the carbamine derived from dureline (q. v.) by distillation. It is very stable towards HCl, by which it is not saponified to the acid, but at 250° it decomposes with formation of tetra-methyl-benzene (Hofmann, B. 17, 1914).

**Amide** C₆H₅Me₂CONH₂. [173°]. Formed by passing gaseous cyanic acid and HCl into durene containing AlCl₃ at 100° (Gattermann, A. 386, 83; B. 23, 1230). Needles (from water) or prisms (from 70 p.c. alcohol); v. sol. cold, sl. sol. hot water, v. e. sol. hot alcohol. Volatile with steam. May be distilled.

**Penta-methyl-benzene acid** C₆H₅Me₂CO₂H [210-6°]. Formed from penta-methyl-benzene, CO₂, and AlCl₃ at 0°; after a fortnight the product is exposed to moist air and then treated with water (Jacobsen, B. 23, 1230). Needles (from water) or prisms (from 70 p.c. alcohol); v. sol. cold, sl. sol. hot water, v. e. sol. hot alcohol. Volatile with steam. May be distilled.

With H₂SO₄ it yields C₆H₅Me₂ and durene (prehnitene). HNO₃ forms di-nitro-c-durene. Fuming HClaq at 200° yields CO₂ and penta-methyl-benzene. — Ca₄’. Prisms; m. sol. water.—Ba₄’.aq. Plates; sol. hot water.

**Methyl ether** Me₄’. [67-6°]. (300° i.V.). Plates; v. sol. alcohol.

**Amide** C₆H₅Me₂CONH₂ [209°]. From C₆H₅Me₂, chloroform-amidine, and AlCl₃. Plates; sol. alcoh., v. sol. cold, water.

**Nitrile** C₆H₅CN. [170°] (J); [168°] (H). [292°] (El); [295°] (J). Formed from the carbamine C₆H₅CONH₂ by intra-molecular transformation by heating it a few degrees above its melting-point (Hofmann, B. 18, 1825). Large white needles; sol. alcohol and ether, insol. water. It is remarkably stable, and could not be saponified by treatment with acids or alkalis.

By heating with III at 220°—230° it yields penta-methyl-benzene, NH₃, and CO₂. Conc. HClaq at 215° also yields C₆H₅Me₂.

**METHYLBENZOIC ACIDHYDE v. TOLUOL ADENHYD.**

**Di-methyl-benzene aldehyde** C₆H₅Me₂CHO [4:2:1]. m-Xylobaldehyde. Xylylic aldehyde. [8°]. (216°). Formed by oxidizing di-methyl-benzalcohol with K₂Cr₂O₇ and H₂SO₄ (Hinrichsen, B. 21, 8065; 22, 121). Separated by K₂CO₃. Colourless oil, volatile with steam. HNO₃ oxidizes to di-methyl-benzene acid (332°).

**Di-methyl-benzene aldehyde** C₆H₅Me₂CHO [5:3:1]. (221°). Formed by mesitylene by treatment in CS₂ with CrO₃Cl, followed by water (Staud, C. R. 97, 909). The yield is almost the theoretical quantity. Yields mesitylene acid on oxidation.

**Tri-methyl-benzene aldehyde. Phenyl hydrazide** Me₂C₆H₅.CH.N.HPh, [199°]. Formed by the action of tri-methyl-benzene aldehyde on a solution of phenyl-hydrazine in dilute H₂O₂ (Rudolph, A. 218, 100). Colourless needles, very sensitive to light; v. sol. ether, hot alcohol, and petroleum ether.


**Acetyl derivative** C₆H₅Me₂CO₂H [100°]. White crystals; v. sol. alcohol and ether.

**Benzoyl derivative** C₆H₅Me₂CO₂B₄’ [119°]. White crystals; v. sol. alcohol and ether.

**METHYL-BENZONITRILE v. Nitric of Toluid acid.**

**DI-METHYL-BENZONITRILE v. Nitric of DI-METHYL-BENZOIC ACID.**

**METHYL-BENZOPHENONE v. Phenyl tolyl ketone.**

**Di-methyl-benzophenone** v. PHENYLXYLYL KETONE and DI-TOLYL-KETONE.

**TRI-METHYL-BENZOQUINONE CARBONYL ACID v. Ψ-CUMYLQUINONE CARBONYL ACID.**

**METHYL-BENZOYL ACETIC ACID.**


**METHYLBENZYL ETHYL HYDROXYLAMINE v. 1-HYDROXYLAMIN DERIVATIVES.**

**TRI-METHYLBENZYL-PROPONIC ACID v. Ψ-CUMYL-ETHYL-KETONE-CARBOXYLIC ACID.**

**METHYL-DIBENZYL. v. Phenyl-tolyl ketone.**

**METHYL-BENZYL-ACETIC ACID v. PHENYLISO-BUTYL.**

Acetyl derivative \( \text{C}_2\text{H}_3\text{OAc} \) (230°-234°).

Benzyl derivative \( \text{C}_6\text{H}_5\text{OBz} \) (333°).

Benzyl derivative \( \text{C}_6\text{H}_5\text{O} \text{H} \). From the methyl-benzyl alcohol \( \text{C}_6\text{H}_5\text{O} \text{H} \) i.e. \( \text{C}_6\text{H}_5\text{C}_2\text{H}_5\text{OH} \), Melolyl alcohol. (160°-5°). Obtained by saponifying its acetyl derivative with alcoholic potash (Jacobson, B. 22, 1217). Diametric prisms, insol. water, v. sol. alcohol.

Acrical derivative \( \text{C}_6\text{H}_5\text{CH}_3\text{OAc} \). [85°] (310°). Obtained by the action of KOAc and HOAc on the chloroform \( \text{C}_6\text{H}_5\text{CH}_2\text{Cl} \), which is get by heating hexamethyl-benzene with PCl, at 140° (Jacobson). Plates or prisms (from alcohol) v. sol. ether, m. sol. alcohol at 90°, insol. water.

**o-METHYL-BENZYL-AMINE**

\( [2:1] \text{C}_6\text{H}_5\text{Me},\text{CH}_3\text{NH} \). o-Toly-methyl-amine. Xylylamine. (SOLVENT.) Forming a distilling methyl-phenyl-thalamido (derived from o-bromo-xylene) with conc. HClAg in scaled tubes at 200° (Strassmann, B. 21, 577). Liquid, which absorbs moisture and CO\(_2\) from the air. — B\(_2\)'H\(_3\),PitCl; yellow needles. — B\(_3\)'H\(_2\),PitCl; needles (from alcohol). — Piceate B\(_2\)'H\(_3\),Pit\(_2\),O\(_3\); long yellow needles, decomposing above 170°.

Acrical derivative \( \text{C}_6\text{H}_5\text{Me},\text{CH}_3\text{NH},\text{Ac} \). [69°]. Formed by heating the hydrochloride with NaOAc and Ac\(_2\)O. Crystallises from alcohol.

**Methyl-benzyl-amine**

\( [8:1] \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NH} \). (202°). Formed by heating \( \alpha\)-bromo-\( \alpha\)-m-xylene with potassium hexachloroaluminate, and decomposing the product with conc. HClAg at 190° (Brönsted, B. 21, 2170). Colourless liquid, miscible with alcohol and ether. — Absorbs CO\(_2\) from the air. — B\(_2\)'H\(_3\),PitCl; yellow needles. — B\(_3\)'H\(_2\),PitCl; golden plates. — Sulphate (213°). — B\(_2\)'H\(_3\),Pit\(_2\),O\(_3\); [172°]. Plates, v. sol. water. — Piceate [156°].

Acrical derivative \( \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NH},\text{Ac} \). [285°-240°]. Oil.

Benzyl derivative \( \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NHB} \). [69°]. White plates (from alcohol), v. sol. chloroform, HOAc, and benzene.

**p-Methyl-benzyl-amine**

\( [4:1] \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NH} \). Formed by treating an alcoholic solution of the amide of thio-p-tolnic acid with zinc and HClAg (Paterno a Spica, B. 8, 441).

**m-Methyl-benzyl-amine**

\( [4:2] \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NH} \). Xylylamine. (196°). Formed, together with di-methyl-di-benzyl-amine and tri-methyl-tri-benzyl-amine by heating \( \alpha\)-chloro-xylene with alcoholic NH\(_3\), at 116° (Pipher, A. 151, 129). Oil, smelling like herring-brine. Is either the sub-compound or a mixture. Lighter than water. — Absorbs CO\(_2\) from the air. — B\(_2\)'HCl. [185°].

**Neat**; v. sol. water and alcohol. — B\(_2\)'H,PitCl.

**Di-methyl-benzyl-amine**

\( [4:2] \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NH} \). Formed as above (Pipher). Oil, smelling like herring-brine. Lighter than water. Decomposes above 210°. — B\(_3\)'HCl. [186°].

**Neat**; v. sol. cold water, v. sol. hot water and alcohol. — B\(_2\)'HBr. [196°].

**Tri-methyl-tri-benzyl-amine**

\( [4:2] \text{C}_6\text{H}_5\text{Me},\text{CH}_3,\text{NH} \). Formed as above (Pipher). Oil, smelling like herring-brine. Lighter than water. Decomposes above 210°. — B\(_3\)'HCl. [212°] (P). — B\(_3\)'HCl. [204°] (Jannasch, A. 142, 808).

**Di-methyl-benzyl ketone** e. Benzyl-methyl-ktone.
METHYL BENZYL KETONE.

Methyl benzyl diketone C_8H_8O_2 i.e. CH_3CO.COH.C_H_4. [176°]. B.G. 1-0721. This compound forms a crystalline monoxime CH_3CO.C(NH.OH).CH_3C_H_4 with FeCl_3 and dilute HCl (H. Müller a. Pechmann, B. 22, 2133).

Thick yellow oil, smelling like honey.


Di-a-oxim CH_3C(NO.OH).C(NO.OH).CH_3C_H. [81°]. Formed by the action of nitrous acid on toluene benzoylacetate (Ceresole, B. 15, 1876, 3072; 16, 680).

Di-a-oxim CH_3C(NO.OH).C(NO.OH).CH_3C_H. [80°]. Dissolves in aqueous alkalies forming yellow solutions. With NaOH and benzyl chloride it gives CH_3C(O.NO.CH).CH_3C_H, a thick yellow oil, volatile with steam.

Di-o-oxim CH_3C(NO.OH).C(NO.OH).CH_3C_H. [80°]. Methylbenzylcaceionic acid. [181°]. Formed by adding an alcoholic solution of hydroxylamine hydrochloride to an alcoholic solution of the mono-oxim (Schraun, B. 16, 181, 2186). Soluble in NaOH and HCl. Insol. in alcohol, ether, and water. Resists to boiling 110° (Strassmann, B. 21, 578).

White needles (from water), m. sol. hot water. Turns red in air.


Tetra-methyl-dibenzyl-thio-urea C_7H_12N_2S. i.e. (C_H.Me.C_H.N).CS. Diarylbenzylsulphoxides. [177°]. From (4, 2, 1)-di-methylbenzyl-amine and alcoholic CS. (Hinrichsen, B. 22, 123). Glittering needles (from hot alcohol).

Methyl-benzyl-urea C_7H_12N_2O. i.e. [2:1]C_H.Me.C_H.N.CO.NH. [173°]. Formed from o-methylbenzyl-amine sulphate and potassium cyanate (Strassmann, B. 21, 578). Radiating moss-like crystals (from alcohol), insol. in water.


Di-methyl-dibenzyl-urea C_7H_12N_2O. i.e. C_H.Me.C_H.N.CO.OH. [137°]. Formed from m-methylbenzyl-amine and COCl in alcoholic solution (B). Insol. in water from which it separates as a flocculent pp.


METHYL BORATES.

Tri-methyl-borate Me_3BO (72°) (E. a. B.); 85°) (S). B.G. 9-955 (E. a. B.); 940 (S). V.D. 8-66 (E. a. B.). Prepared by heating B_O with methyl alcohol at 100° in sealed tubes, and distilling. The distillate is freed from MoOH by shaking with conc. H_2SO_4 and the upper
DI-METHYL-BUTYLENE-DIKE TONE CARBOXYLIC ETHER. 297

... layer is then rectified (Schiff, *Bt.* [2] 5, 373; 6, 30). Formed also by the action of BO\(_4\) on dry methanol alcohol; the upper layer of the product being rectified (Ebelmen a. Bouquet, *A. Ch.* [3] 17, 69; A. 60, 251) *Colourless mobile liquid, sol. alcohol and ether. Burns with a green flame (greener than that of Et\(_4\)BO\(_4\)). Decomposed by water into boric acid and MeOFi.*

Methyl acetate Me\(_3\)BO\(_4\). A thick liquid, formed by heating Me\(_2\)O with B.O\(_3\). When heated, it begins to decompose at 160° giving off Me\(_2\)BO\(_4\) and at 250° there remains a mass of the composition Me\(_2\)O, which becomes vitreous on cooling.

An acid methyl borate Me\(_2\)BO\(_3\) was described by Ebelmen (A. Ch. [3] 16, 137) as obtained by treating B_2O_3 with dry MeOH, and as being a vitreous mass, readily decomposed by water into boric acid and MeOFi. It was probably a mixture of Me\(_2\)O and MeBO\(_2\).*

**METHYL-BORNYL-UREA** v. **Borornyln-urea**.

**TRI-METHYL-BRAZILIN** C\(_6\)H\(_3\)Me\(_2\)O\(_2\).** Formed in the preparation of tetra-methyl-brazilin (v. *Inyra*). Crystalline, sol. dilute alcohol. Its solution in aqueous NaOH is colourless and gives a brown pp. with FeCl\(_3\).*

**Acetyldervatite** C\(_6\)H\(_3\)AcMe\(_2\)O\(_2\).** Formed by the action of NaOEt and MeI on brazilin (Schliff a. Draelle, B. 20, 3365; 21, 3009). Snow-white crystals. Bormine in HIOAc forms C\(_6\)H\(_3\)BrMe\(_2\)O\(_2\) and crystalline di-bromotetra-methyl-brazilin dibromide C\(_6\)H\(_3\)BrMe\(_2\)O\(_2\).*

**METHYL-BROMACETOL** v. *Di-Bromo-propene.*


**Preparation.**—Methyl alcohol (800 grms.) and anhydrous phosphorus (133 grms.) are put into a retort. Bormine (800 grms.) is slowly run in. After some hours the retort is heated and the red smoke condensed in a receiver surrounded by a freezing mixture. It is washed with dilute potash, dried over calcium chloride and distilled (Merrill, J. pr. 126, 296; cf. Pierre, J. Ph. [3] 13, 150; Bunsen, A. 46, 44).

**Properties.**—Colourless, mobile liquid, with burning taste and pleasant smell resembling chloform. Burns with greanish-brown smoky flame. Miscible with alcohol, ether, chloroform, and CS\(_2\). Poured into cold water a white ice-like mass is formed. It is approximately CH\(_3\)Br, 20aq. At 5° it begins to split up with evolution of methyl bromide gas.

**METHYL-BROMO-ACETIC ACID** v. *Bromo-acetic-acetic acid.*

**METHYL-BROMO-ACETOL** v. *Di-Bromo-propene.*

**METHYL BROMO-ALLYL OXIDE** C\(_6\)H\(_2\)BrO i.e. CH\(_2\)O.CH\(_2\)Br.CH\(_2\)O. (118%). S.G. 2 1.35. Formed by the action of NaOAc on CH\(_2\)O.CH\(_2\)Br.CH\(_2\)O (Henry, B. 5, 455).

**METHYL BROMO-ALLYL SULPHIDE** C\(_6\)H\(_2\)S+8 i.e. CH\(_2\)S.CH\(_2\)CH\(_2\)Br. Formed by heating Pb(SMe\(_2\)) with s-tri-bromo-propene in ethanol solution at 150° (Obermeyer, B. 20, 2125). Decomposes at 120°-180°. Combines with Br (1 mol.).

**METHYL-BROMO-AMINE** v. *Methylamin.*

**METHYL-DI-BROMO-ANTHRACENE** v. *Di-bromo-phenanthrene.*

**METHYL-DI-BROMO-ATROLACIC ACID** v. *Di-bromo-oxyllic acid.*

**METHYL BROMO-BUTYL KETONE** v. *Acetylbutil bromide.*

**TRI-METHYL-BROMO-ETHYL AMMONIUM BROMIDE** v. *Trimethylamin-methyl bromide.*

**METHYL-BROMO-ISATIN** v. *Methyl derivative of Bromo-isatin.*

**METHYL-BROMO-ISATOID** v. *Bromo-methylisatoic.*

**METHYL BROMOPROPYL KETONE** CH\(_3\)CO.CH\(_2\)CH\(_2\)Br. *Acetyl-propyl bromide.* (118%) at 50 mm. (L); 106°, at 60 mm. (L). Formed by treating acetyl-propyl alcohol (g. v.) with a saturated aqueous solution of HBr (Colfin a. Perkin, jun., C. J. 55, 357; Lipp, B. 22, 1190). Colourless mobile liquid with penetrating odour. Turns brown in light. St. sol. cold water, quickly decomposed by hot water, dissolving as acetyl-propyl alcohol. Forms a crystaline compound with NaHCO\(_3\). NaOEt and KOH act on it, forming a light ethereal oil CH\(_3\)H\(_2\)O (113°), probably methylene-furfurane tetrazydride.

**METHYL-BROMO-STYRENE** v. *Bromo-toluylen.*

**METHYL BRUCINE** v. *Methyl compounds of Brucine.*

**METHYL BUTENYL KEONE** v. * Allyl acetone.*

**METHYL ISOBUTYL ACETAL** v. *Aldehyde.*

**METHYL-BUTYL ACETIC ACID** v. *Heptic acid.*

**Methyl-di-butyl-acetic acid** v. *Hendecic acid.*

**METHYL-BUTYLACETYLENE** v. *Heptin.*

**METHYL ISOBUTYL ANILINE** C\(_6\)H\(_4\)N i.e. C\(_6\)H\(_5\)MeC\(_6\)H\(_5\)Br. (235°) (Noeltling, J. 1853, 702). **METHYL ISOBUTYL BENZENE** v. *Isobutyl-toluene.*

**METHYL BUTYL CARBINOL** v. *Hexyl alcohol.*

**Di-methyl-butyl-carbinol** v. *Hexyl alcohol.*

**METHYL ISOBUTYL CARBONATE** C\(_6\)H\(_5\)O\(_2\) i.e. CH\(_3\)O.CO.OOC\(_6\)H\(_5\) (143°-4° cor.). S.G. 2 25 (Röse, A. 205, 230).

**DI-METHYL-BUTYLENE-DIKETONE** C\(_6\)H\(_5\)O\(_2\) i.e. CH\(_3\)CO.CH\(_2\)CH\(_2\)CH\(_2\)CO.CH\(_3\). (44°). Obtained by heating its dicarbonyl ether with NaOMe in MeOH (Marshall a. Perkin, jun., C. J. 37, 241). Crystalline mass, sol. sol. water, sol. other menstrua. Combine with Na\(_2\)CO\(_3\). Reacts with phenyl-hydrazine and with hydroxylamine. Boiling aq. solution of potash condenses it forming methylpentamethenyl-trihydride methyl ketone CH\(_3\)C\(_6\)H\(_4\)C\(_6\)H\(_5\).
DI-METHYL-BUTYLENE-DIKETONE CARBOXYLIC ACID ETHER.

**di-acetyl-n-valeric ether.** (105°-200°) at 100 mm. Obtained by distilling the corresponding di-carbonylic ether (di-acyl-adipic ether) with potash, neutralising the residue with ZnO, extracting with ether, washing the ether with water, drying and evaporating (Perkin, jun., C. J. 57, 229). Colourless oil, v. sol. ether and alcohol, sl. sol. water. Its alcoholic solution is coloured violet by FeCl₃. On hydrolysis it yields acetyl-valeric acid and acetic acid.

**Di-methyl-butylene-diketone dicarbonylic ether O₄C₂H₄O₃** i.e., CH₂CO.CH(CO)Et.CH₂CH₂CH₂CH(CO)Et.CO.CH₂

Bisethylene-di-ceto-acetic ether. Di-acyl-adipic ether. Formed by the action of sodium (46 g.) on aceto-acetic ether (290 g.) and ethylene bromide (190 g.), dissolved in alcohol (Perkin, jun., C. J. 57, 215). It may be purified by conversion into the yellow flocculent di-sodium compound (As.CNa₂(CO)Et.CO.CH₂), decomposing this with very dilute HCl, and extracting with ether. They are soluble in alcohol and ether, and sol. dilute aqueous KOH. FeCl₃ colours its alcoholic solution intense violet-red. Combines with great difficulty with NaHSO₃. Decomposed by heat into di-methyl-butylene-diketone carbonylic ether, and the two ethers

\[
\text{C}(\text{CH}_2)\text{C}:\text{O:CO.CO.CH}_2 \\
\text{CO.CO.CH}_2\text{C}:\text{O:CO.CO.CH}_2
\]

**CO₂Et.CH.CO.CH₂**

Alcoholic ammonia converts the dicarbonylic ether into the di-imide (\(\text{C}(\text{CH}_2)\text{C}(\text{NH})\text{Et})\text{C}(\text{NH})\text{Et}\), which is recovered by warming with dilute HCl into the original ketonic ether.

**Phenyl hydraside** (\(\text{C}(\text{C}(\text{N})\text{H})\text{H})\text{C}(\text{N})\text{H})\text{Et})\text{C}(\text{N})\text{H})\text{Et}\)). [64]. Formed by heating di-methyl-butylen-diketone carbonylic ether with phenyl-hydrazine on the water-bath (Perkin, jun., C. J. 57, 221). Plates or needles (from MeOH), v. sol. conc. HClH₄, insol. alkalis, v. sol. ether. At 20°C it gives off EIOH (2 mols), forming di-oxy-di-phenylmethylene-di-pyrazole tetrahydrde

\[
\text{CO.CH.CO.CH}_2\text{C}:\text{NPH}\text{NPH}
\]

**NPH**

**N : CMe**

**NMeCMe**

**METHYLISOBUTYL GLYOXALINE. Methyl isothiocyanate C₆H₃N.S.i.e. N₃C₆H₃M₃C₆H₃M₃.** [170°]

Formed by treating isobutyl-glyoxaline (glyoxal-isosamylene) with MeI in MeOH (Radziszewski a. Szul, B. 17, 1934). Triectro prisms (from alcohol).


**Methyl isobutyl ketone** CH₃C₂H₄CO.C₂H₅ (115°). S.G. 0.8385. [80°] (Wagner, J. R. 16, 703). A product of the distillation of potassium isovalerate with NaOAc (Williamson, A. 81, 46). Formed by the action on valeryl chloride of ZnMe₂ followed by water. Formed also by boiling isopropyl-aceto-acetic ether with baryta-water (Frankland a. Duppe, A. 145, 85).

Combines with NaHSO₃. Yields on oxidation acetic, isobutyric, and isovaleric acid.

**Methyl sec-butyl ketone** CH₃C₂H₄C₆H₅ (118° i.V.) S.G. 1.28181. Formed by boiling methyl-ethyl-acetone-cetic ether with dilute KOH or baryta-water (Wislicenus, A. 219, 307; Wagner, J. R. 16, 711). Oil, smelling of peppermint. Oxidised by chromic acid mixture to methyl ethyl ketone and H₂O₃. Sodium reduces it to the corresponding hexyl alcohol and methyl acetyl pinacole [249°].

**Methyl tert-butyl ketone** CH₃C₂H₄C₆H₅ (104°-3°) (Schiff, B. 19, 602). S.G. 0.82955; 18°-300°.

**Formation.**—1. By distilling pinacole with dilute sulphuric acid (Fittig, A. 114, 58).—2. By the action of CH₃C₂H₅OCl on ZnMe₂, followed by water (Butlerow, A. 174, 125).—3. By the dry distillation of calcium isobutylate (Barbaglia a. Gucci, B. 13, 5679).

**Properties.**—Liquid, smelling of peppermint, nearly insol. water. Sodium-amalgam forms the corresponding hexyl alcohol. Combines with NaHSO₃. Chlorine forms blue crystals of CH₃C₂H₄Cl₂ crystallising in needles [51°], [178°].


**Methyl isobutyl diketone** C₆H₅O₂C₂H₅ (138°) S.G. 0.91. Formed by distilling its mono-oxim with dilute H₂SO₄ (Otto a. Pechmann, B. 22, 2122). Yellow oil with irritating smell, becoming fruity when diluted. Sl. sol. water.

**Mono-oxim** CH₃C₂H₄CO(CNOH)C₆H₅ (142°). Formed by adding NaN₂ (10 g.) to a solution of isobutyl-aceto-acetic ether (27 g.) in water (300 c.c.) and KOH (8 g.), and extracting with ether (Treadwell a. Westenberger, B. 15, 2786). White plates, v. sol. alcohol and ether, sl. sol. cold water, dissolves in alkalies.

**Dioxim** CH₃C(OOH)C₂H₅ (172°). Small white shining plates (from dilute alcohol) (O. a. P.).

**Phenyl-hydraside** CH₃C₂H₅N₃O₃ i.e. CH₃C(NH)H₅C₆H₅ (165°). Almost colourless needles.

**Phenyl hydraside** CH₃C₂H₅N₃O₅. [98°]

**Almoost colourless needles.**

**Diphényl hydraside** CH₃C₂H₅N₃O₅ i.e. CH₃C(NH)H₅C₆H₅ (116°-5°). Almost colourless needles.

**METHYL n-BUTYL KETONE CARBOXYLIC ACID.** CH₃C₂H₅O₂C₂H₅ i.e. CH₃C₂H₄CH₂CH₂CH₂CO.H = Acetylvaleric acid. [42°]. A product of the hydrolysis of di-methyl-butylen-diketone carbonylic ether by a solution of KOH in methyl alcohol (Perkin, jun., C. J. 57, 231). Colourless crystals, v. sol. water, alcohol, and ether. Its ammonium salt is very soluble.—Ag₂+: leafy masses (from hot water). The cupric salt forms minute spherules.

**METHYL ISOBUTYL KETONE SULPHONIC ACID.** CH₃C₂H₅C₆H₅(SO₃)H. The sodium salt of this acid is slowly formed by the action of a
METHYL-CARBAMIC ACID.

...saturated solution of NaHSO₄ on mesityl-oxide. It is easily soluble in water and alcohol, melts at 95°, is not attacked by Na₂CO₃, but by NaOH it gives mesityl-oxide (Pinner, B. 18, 592).

METHYL BUTYL KETONE v. Methyl butyl ketone.

METHYL N-BUTYL OXIDE CH₃(N-C₄H₉)₂ i.e. CH₃.O.C₄H₉ (70-3°). S.G. 7856. S.V. 127-2. C.E. (0°-10°) 0-0125 (Dobrenier, A. 248, 3).


Methyl isobutyl phenol. Formed by the action of nitric acid on methyl-isobutyl-phenoxy-amine (Efron, B. 17, 264). Oil. V. sol. alcohol and ether, nearly insol. water.

Isomeride v. Methyl ether of isobutyl-phenol.


Salts.—B₃HCl. Long thin needles, sl. sol. cold water, v. sol. hot water.—B₃HBr: long soluble needles. —B₃H₂SO₄: needles, sl. sol. cold water; B₃H₂SO₄+H₂O: slivery needles, insol. ether.

Formyl derivative C₆H₅.CH₃.NH.CO. (107°). Colourless tables, v. sol. alcohol and ether, nearly insol. cold water.


Benzoyl derivative C₆H₅.CH₃.NH.NHz. (165°). Small white needles, insol. cold water, v. sol. hot.


Formyl derivative C₆H₅.CH₃.NH.CO. (105°). White plates, v. sol. alcohol and ether, nearly insol. water.

Acetyl derivative C₆H₅.CH₃.NHAc. (141°). Long silky needles.

Benzoyl derivative C₆H₅.CH₃.NH.NHz. (142°). Silvery plates.


METHYL-BUTYL-PIMACONE v. Di-oxydibenzyl.

METHYL-DI-ISOBUTYL-PYRAZINE C₆H₅.N₂N₂ i.e. N-C₄H₉.CH₃.C₄H₈.O(NH)C₄H₉ (248°). Formed by the reduction of the methyl isobutyl diketone Me₂CO.O(NH)C₄H₉ with tin and HCl (Lang, B. 18, 1864; Oeconomides, B. 19, 2926; Wolf, B. 20, 433). Yellow oil.—B₃H₂PCl₃: orange needles.


Di-ethyl ether Et₂A². (312°-318°). Formed by passing nitrous acid gas into an alcoholic solution of its dihydroxy. Thick oil.—Et₂A²HCl: long needles, decomposed by water into HCI and Et₂A²Cl.—Et₂A²H₂.PCl₃. (206°). Cubes.

Dihydride of the diethyl ether NH₂·Me₂CO·CO·NH₂·CH₃ i.e. (CH₃)₂CH·SO₃H. (100°). Formed by warming acetoxyacetic ether with isovaleric acid-ammonia in alcohol (E.). Long prisms, v. sol. alcohol, ether, and benzene.

METHYL ISOBUTYL SULPHATE C₆H₅.SO₃H i.e. C₆H₅(CH₃)SO₃H appears to be formed by the action of methyl alcohol on C₆H₅.O.S.O₃H, the product of the action of isobutyl alcohol on SO₃Cl₂ (Lehmann, J. pr. [2] 15, 84). Decomposed by water into HOMe and C₆H₅.O.S.O₃H.

DI-METHYL-ISOBUTYL-ACETO ETHER v. Di-isobutyldi-tolylacetic acid.

METHYL-CAFFÈIC ACID v. Caffeinic acid.

METHYL-COFFUGIC ACID v. Caffeine.

METHYL CARBAMATE NH₂.CO·Me. Methyl-urethane. (52°) (G); [56°] (E. & K.). (177°). Formed from NH₂·CO·Cl and excess of methyl alcohol (Gattermann, A. 244, 99). Formed also from C₆H₅.N(Me₂CO)·Me, by the action of NH₃ (Franchimont s. Klobbe, R. T. C. 7, 843).

METHYL-CARBAMIC ACID NH₂.CO·H₂. The m ethylammonium salt NH₂.CO·NHMe appears to be formed by pass-
METHYL-CARBAMIC ACID.

Methyl hydrazine. methyl hydrazine acid sulphato and KNO₃ (Brüning, A. 253, 100). Prismatic tablets; v. sol. water and ETOH; m. sol. ether.

**METHYL-CARBAZOLE C₉H₇N i.e. C₉H₇NMe**

**METHYL-CARBAMIC-ALLYL THIO-UREA**

**METHYL-CARBAMIDO-ETHYL THIO-UREA**

**TRI-METHYL CARBONOL v. TERT-BUTYL ALCOHOL.**

**METHYL CARBONATES.**

Hydrogen methyl carbonate *MeHCO₃*.

**METHYL-CARBOXYLIC ACID v. METHYL FUMARIC ACID.**

**METHYL-CARBOSTYRIL v. METHYL ether of CARBOESTERL and OXY-METHYL-QUINOLINE.**

**METHYL-CHELIDAMIC ACID v. CHELLIDONIC ACID.**

**METHYL-CHLORACETOL v. Di-chloro-PROPANE.**


**FORMATION.**—1. By heating a mixture of NaCl (2 pds.), wood spirit (1 pt.), and H₂SO₄ (8 pts.) and collecting the gas over water.
METHYL-COCAINE.

(Dumas a. Pégolot, A. Ch. 61, 193; A. 15, 17.)—

2. By expelling a mixture of equal volumes of methanol and chloroform to day light (Berthelot, A. Ch. [5] 52, 57).

Preparation.—1. HCl is passed into MeOH (2 pts.) containing ZnCl₂ (1 pt.). The gas is passed through KOH and H₂SO₄ (Grove, C. J. 27, 641; A. 174, 378).—2. By heating dimethylylamine hydrochloride at 280°, the reaction being perhaps 3NMe₂HCl + 2NMe₂ + NH₂ + 3MeCl (Vincent, J. Ph. [4] 30, 183).

Properties.—Colourless gas, with ethereal odour. Burns with a bright flame, edged with green.

Reactions.—1. When passed through a red-hot tube it deposits charcol and yields HCl, methanol, ethylene, CO, and napthalene (Perrot, A. 101, 876).—2. When passed over heated potash it yields potassium formate, KCl, and hydrogen. —3. Not attacked by chlorine in diffuse daylight, but when the mixture is exposed to direct sunlight, substitution occurs, the products being methyl chloride, chloroform, and CCl₄. The chlorination may also be effected by passing a mixture of chloric acid and methylchloride over animal charcoal at 250°-350° (Dumas-Cauchois, C. R. 92, 545).—4. When equal volumes of methyl chloride and of an amine are submitted to a pressure of 25 atmospheres for 48 hours the following reactions occur.—

(a) Ammonia forms NMe₂HCl, NMe₂HCl, and N₂HCl. —(b) Methylamine forms 3NMe₂HCl, Me₂NHCl, and H₂O. —(c) Dimethylylamine reacts with formaldehyde and 2NMe₂HCl and N₂Me₂Cl. —(d) Dimethylamine forms NMe₂Cl (Vincent a. Chappuis, B. T. [2] 45, 496).

Hydrate: MeCl₂ 9aq. Formed by cooling below 0° water into which MeCl₂ is passed. Its vapour pressure has been studied by De Forcrand a. Villard, C. R. 106, 1357, 1404.

METHYL-CHLORO-ALLYL CARBINOL v.

CHLORO-PENTENYL ALCOHOL.

DI-METHYL-CHLORO-ÁNILINE v. CHLORO-

DI-METHYL-ÁNILINE.

TRI-METHYL CHLORO-ÁURPHOSPHITE

Me₃P⁺Me₂Cl⁻ (101°). Formed by the action of phosphorus pentoxide on a methanol solution of the product of the reaction of phosphorus pentoxide on methyl chloride and phosphorus (Lindén, C. B. 103, 1014). Slender colourless needles, f. 130° water, sol. MeOH.

METHYL CHLORO-BUTYL CARBINOL v.

CHLORO-HEXYL ALCOHOL.

METHYL - CHLORO CARBORYL v.

CHLORO-OXY-METHYL-QUINOLINE.

METHYL CHLORO-ETHYL OXIDE C₂H₅O⁻

i.e. CH₂=CHClO⁻ (72°-75°). S. G. 1.098. Formed from aldehyde (1 vol.), methyl alcohol (1 vol.) and dry HCl at 90° (Geuther, A. 225, 270).

METHYL TETRA CHLORO-ETHYL OXIDE

C₂H₅ClO⁻ i.e. C₃Cl₄O⁻ (173°). S. G. 1.048. Formed by the action of PCl₅ on chloral methylene (Magnanini, G. 16, 830). Colourless liquid.

METHYL CHLORO-FORMAMIDE v. CHLORO-

FORMIC ACID.

METHYL CHLORO-PROPYL KETONE

c₂H₅ClO⁻ i.e. CH₂=CH₂ClO⁻ (150°). Formed by heating CH₂=CHClO⁺ClO⁻ with dilute HCl at 180° (Conrad, A. 186, 241).

Methyl tri-chloro-propyl ketone C₃Cl₃O⁻ i.e. CH₂=CH₂ClO⁻ (173°). Formed by oxidising

C₃H₅Cl₂CH₂ClO⁻ with a mixture of concentrated H₂SO₄ and chromic acid mixture (Garzarolli-Thurnhaffer, A. 223, 159). Heavy oil. Does not combine with NaH₂PO₄. Yields CO₂, acetic acid, and HCl on oxidation.

DI-METHYL-CHLORO-VINYL OXIDE

CH₂ClO⁻ i.e. CH₂=CH₂ClO⁻ (101°). S. G. 1.098. Formed by heating tri-chloro-ethylene with KON, being p.p. on addition of water (Debench, G. 14, 117). Colourless oil, with an odour resembling that of acetal. Decomposed on exposure to air, with evolution of HCl. When heated with dilute H₂SO₄, it yields di-chloro-acetic acid, chloraldehyde.

Methyl tri-chloro-vinyl oxide

C₃Cl₃O⁻ i.e. CH₂=CH₂ClO⁻. Ready to absorb dry oxygen, forming the compound CCl₃.e.CCl₂(Oe), which, by the action of water, gives oxalic acid (Henry, Hz, 12, 1393).

METHYL-CHRYSOIDINE v. BENZENE-AZO-

METHYL-Phenylene-diimine.

METHYL-CINCHENIC ACID v. CINCHENE.

METHYL-CINCHENAMINE v. CINCHONA

BASES.

DI-METHYL-CINCHONIC ACID v. DI-

METHYL-QUINOLINE CARBOXYLIC ACID.

METHYL-CINCHONIDINE v. CINCHONIDINE.

METHYL-CINCHONINE v. CINCHONINE.

METHYL-CINNAMIC ACIDS v. PHENYL-

METHACRYLIC ACID AND TOLU-ACETIC ACID.

METHYL-CINNAMIC ALDEHYDE v.

PHENYL-METHACRYLIC ALDEHYDE.

METHYL CINNAMYL KETONE v. BENZYL-

IDEX-ACTEONE.

METHYL-CINNOLINE CARBOXYLIC ACID

C₅H₅N.O₂ i.e. C₅H₄(COH)N-NO₂ [y i.e. 230°].

Small tables or fine needles. Sol. acetic acid, al. sol. hot alcohol and hot water, insol. cold water. Dissolves both in aqueous acids and alkalis, forming easily soluble salts. Obtained, as yellow pp, by adding Na₂O₂ to a cold solution of the hydrochloride of amido-propenyl-benzoic acid C₅H₄(C=CH₂)N₂(C₅H₄)₂ (124); very probably di-azo-propenyl-benzoic acid C₅H₄(C=CH₂)<sup>N=N</sup>N-OH is first formed, which then splits off H₂O (Widman, B. 17, 729).

METHYL-CINTRAAMIC ACID C₅H₅N.O₂ [47°].

Extracted from synthetic cocaine (cf. vol. ii. p 230) in which it occurs in very small quantity (Liebermann a. Giesl, B. 28, 508, 296). An oil, which crystallises after standing some hours. Fpd. by Na₂CO₃ from its salts. Very sol. ether, chlorform, benzene, and ligroin. It can be separated from ordinary cocaine by means of its nitrate. A 5-8 p. c. solution of the hydrochlorid in a 2-dm. tube gave a rotation of +4°5. By heating with water it is not so easily decomposed as ordinary cocaine. By boiling with hydriodic acid Mel is split off. By hydrochloric acid it is split

[Note: The text is a form of chemical description, possibly from a textbook or scientific journal, discussing various chemical preparations and reactions, including the synthesis and properties of methyl cocaine and other related compounds.]
up finally into methyl alcohol, benzoic acid, and methyl eucine hydrochloride. This reaction is also more difficultly brought about than with ordinary cocaine. Methyl-cocaine appears to be identical with 'dextro-cocaine,' a body got by heating the methyl-ether of dextro-cocaine with HCN (Hesse, Ber., 23, 2416). 

Salts.—B.HCl. [210°]: needles or columns forming rosettes (from hot alcohol) ; much less soluble than the hydrochloride of ordinary cocaine. —Sulfate: plates, v. sol. water, sl. sol. alcohol. —Nitrate: crystals, sl. sol. water. —Platino-chloride (C₆H₅NO₂.HCl), PtCl₄; glittering yellow needles (from hot water). —Auro-chloride C₆H₅NO₂.HClAuCl₃. [148°]: needles; melts under water to a yellow oil. 

**METHYL-CODEINE** C₆H₅NO₂ i.e. C₆H₅MeNO₂ or C₆H₅MeNO₂. [118-5°]. [a]D = -200° in a 4 p.c. solution (in 97 p.c. alcohol) at 15°. Formed by boiling codeine methylidioxide C₆H₅MeO.Me with potash, and extracting with water (Hesse, C. 15, 277, 275).—Anhydrous prisms (from alcohol or ether), or hydrated crystals (containing aq) (from water). Insol. water, v. e. sol. hot alcohol, m. sol. ether. Its solution in conc. H₂SO₄ is violet, but becomes blue on heating. Boiling AO, forms a compound C₆H₅O₃. [131°]. Its hydrochloride forms a brown solution in H₂SO₄, which becomes yellow on warming, and finally blue on exposure to the air. B. HCl 2aq.: needles. S. 9 at 18°. V. e. sol. alcohol, sl. sol. NaClAg. —B₁H₂PCl₄aq. 

Acetyl derivative C₆H₅AcMeNO₂. [60°]. Formed by heating methyl-codeine with Ac₂O at 80°, adding aqueous NH₃, and extracting with ether (Hesse, C. 222, 222). Glittering tables (from ether); v. sol. alcohol and ether, sl. sol. water, insol. KOHAg. Alcoholic potash forms potassium acetate and methyl-codeine. 

—(C₆H₅MeO₂.HCl₂aq.: plates, yl. sol. cold water. (C₆H₅MeO₂.HCl₂aq.: yellow plates. (C₆H₅MeO₂.HCl₂aq.: yellow plates. 

(a)-**Methyl-o-iodide** C₆H₅NO₂I. [85°]: prisms, formed at once on dissolving methyl-codeine in a mixture of Me₂ and methyl alcohol (Hesse). 

(b)-**Methyl-o-iodide** C₆H₅NO₂I. 

Blender crystals, formed by boiling the preceding with aqueous NaOH, and ppg. with KI. It is less soluble in water than its (a)-isomeride. Ag₂SO₄ forms (C₆H₅NO₂Me)₂SO₄ crystallising in plates. 

(a)-**Methyl-chloride** C₆H₅NO₂MeCl. From the (a)-iodide and Ag₂Cl. Amorphous. With platinic chloride it yields a yellow flocculent ppt. of (C₆H₅NO₂Me)₂PtCl₄. With AO, it yields plates of C₆H₅AcNO₂MeCl 2aq. which crystallises in long satiny needles, v. e. sol. alcohol, sl. sol. cold water. Its platinochloride (C₆H₅AcNO₂MeCl)PtCl₄ 4aq. is a yellow crystalline ppt. 

(b)-**Methyl-chloride** C₆H₅NO₂MeCl 4aq. Radiating crystalline mass, v. sol. water and alcohol. With conc. H₂SO₄ it gives a purple colour. With platinic chloride it yields an orange ppt. of small needles of the platinochloride (C₆H₅AcNO₂MeCl)PtCl₄. With AO, it yields yellowishish C₆H₅AcNO₂MeCl, which forms (C₆H₅AcNO₂MeCl)PtCl₄ 4aq., a yellow powder. 


**METHYL-COLCHICINIC ACID** v. **Dimethyl-colchicinonic acid.** 

Tri-methyl-colchicinic acid C₆H₅NO₂ i.e. C₆H₅(OMe)₃(NH₂).CO₂H. [149°]. Formed by the action of HCl on colchicin (q. v.) Forms a platinochloride B₁H₂P(OH)₂Cl₂aq. On warming with acetic acid it yields colchicine C₆H₅(OMe)₂(NH₂).CO₂H. With MeOH it forms an added product C₆H₅NO₂Me₂MeO₂H. On warming with MeOH, methyl iodide, and sodium it yields 'tri-methyl-colchidimethiamic acid' C₆H₅(OMe)₂(NMe₂).CO₂H [125°]. The methyl ether of this body forms an iodomethyl C₆H₅NO₂Iaq. (Hesse, M. 9, 877). 

**METHYL-COMININE** v. Coine. 

**METHYL-COMARIC ACID** v. Methyl-derivative of Comaric acid. 

Di-methyl-di-comaric acid. 

**METHYL-COMARILIC ACID** C₆H₅.O₂CCH₃. C₆H₅(CH₃)CO₂H. [157°]. Formed by the action of dilute KOH upon the methyl-derivative of ethoxy-bromo-comaric acid (Perkin, C. J. 30, 423). Noodles (from CH₃). 

(b)-**Methyl-comarilic acid** C₆H₅O₂CCH₃. C₆H₅(CH₃)CO₂H. [157°]. Formed by saponifying its ethyl ether with alcoholic potash (Hantzsch, B. 19, 1290). Feathery needles (from nitrous alcohol). Decomposed by heat into CO₂ and (b)-methyl-comarone. —KAq: needles. —NH₂KAq: needles (from water). —BA₃: 3aq. —Ag₂Aq: minute prisms. 

Ethyl ether EtAq. [51°]. [230°]. Formed by the action of sodium phenolate NaOCH₃ upon chloro-aceto-acetic ether, the resulting phenoxy-aceto-acetic ether being condensed by cold conc. H₂SO₄ (Hantzsch). 

Amide C₆H₅(CH₃)CO₂NH₂. [145°]. Noodles (Hantzsch, B. 19, 2401). 

**Bis-di-methyl-comarone-a-carboxylic acid.** [205°]. Formation. —1. By the action of hot alcoholic KOH upon bromo-di-methyl-comaric acid C₆H₅(CH₃)CO₂H. 

C₆H₅(CH₃)CO₂H < CO₂.O_.CO₂.H. —2. By saponification of the ethyl-ether obtained by the reaction of sodium p-cresol and chloro-aceto-acetic ether. 

Properties. —Short prisms or plates. On heating the sodium salt with lime di-methyl-comarone is obtained. Ethyl ether EtAq. [56°]. [300° at 739 mm.] (Hantzsch a. Lang. B. 19, 1290).
METHYL-CYANO-FORMAMIDE.

Reference.—COTMARILIC ACID and OXY-METHYL-CYANO ACID.

**METHYL-COUMARIN** v. **Anhydride of Oxy-phenyl-crotonic acid.**

**m-Di-methyl-coumarin** C₆H₄NO₂, i.e. C₆M₄CH₂

\[ \text{C}_6\text{H}_4(\text{CH}2)_2\text{CH}=\text{O} \]  


Reference.—**BROMO-DI-METHYL-COUMARIN.**

**Di-methyl-di-coumarin** C₆H₄(O)₂, i.e. C₆M₄(CH₂)₂

\[ \text{C}_6\text{H}_5(\text{CH}2)_2\text{CH}=\text{O} \]  

Formed by dissolving resorcinc (1 mol.) and acetoacetic ether (2 mols.) in conc. H₂SO₄; yield 10 p.c. Microcrystalline white powder. V. sl. sol. boiling alcohol, nearly insol. water, ether, chloroform, benzene, &c. Dissolves in aqueous alkalis to a yellow solution, from which acids ppt. di-methyl-di-coumaric acid C₆H₄(O)₂(C₆H₄CH₂CO₂H). The latter forms a white powder, sol. alcohol; at 110° it is completely reconverted into the anhydride (Hantzsch a. Zürcher, B. 20, 1329).

**Tri-methyl-tri-coumarin** C₆H₃(NO)₃, i.e. C₆M₃(O)₃

\[ \text{C}_6\text{H}_5(\text{CH}2)_3\text{CH}=\text{O} \]  

[189°]. Formed, together with CO₂, by distilling [8]-methyl-coumarilic acid. Oil, volatile with steam. Does not react with phenylhydrazine or phenylhydrazine. Di-methyl-coumarone C₆H₄(CHO)₂, i.e. C₆H₄(CHO)₂(\text{CH}2)₂\text{CH}=\text{O}. (210° at 728 mm.)

Indiff. oil. Formed by distilling the sodium salt of di-methyl-coumarilic acid (di-methyl-coumarone-carbonylic acid with lime) (Hantzsch a. Lang, B. 19, 1300).

**METHYL - CREOSOL** v. **Methyl ether of CREOSOL.**

**METHYL-CROTONIC ACIDS v. ANGLIC ACID and TACIC ACID.**

**METHYL ISO-CROTYL OXIDE v. SEC-ISO-BUTYL ALCOHOL.**

**METHYL-CUMARIN** v. **METHYL-CUMARIN.**

**METHYL-CUMAZONIC ACID C₇H₉NO₃**

\[ \text{C}_7\text{H}_9\text{O}_2\text{CMe}_3\text{O} \]  

[191°].

**Formation.**—1. By boiling (3:4:1)-amido-oxo-propyl-phenyl-benzoic acid with acetic anhydride.

2. By boiling acetyl-amido-oxo-benzyl-benzoic acid with HCl.


**Reactions.**—By reduction with sodium-amalgam it yields the acetyl derivative of amido-cumonic acid.

**Salt.**—A/HCl—very soluble white needles.——A/HCl—very soluble white needles (Widmann, B. 16, 2576).

**METHYL-CUMENE** v. **CYMENE.**

**METHYL - CYCLODIMethyl** C₆H₄N₂, i.e. C₆H₄(\text{CH}2)₂NMe₂ (44°). Formed by methylation of solid cumuline [89°].——B₃H₆Cl₂PCl₂—sparingly soluble needles (Hofmann, B. 15, 2986).

**Di-methyl - y - cumuline** C₆H₄(\text{CH}2)₂NMe₂ (22°). Oil. Formed by methylation of solid cumuline [85°].——B₃H₆Cl₂PCl₂ (Hofmann, B. 15, 2987).

**Methyl - iodide** C₆H₄(\text{CH}2)₂NMe₄, i.e. C₆H₄(\text{CH}2)₂NMe₄. Yields (C₆H₄(\text{CH}2)₂NMe₄, C₆H₄Cl₂)

**METHYL CUMYL ETHYL KETONE**

C₆H₄(\text{CH}₂)₂CH₂CO₂H₄. Cymulyl-acetone. [269° — 265°]. Is one of the products of the action of NaOH and cumyl chloride on acetoacetic ether (Withmann, B. 22, 2271). Colourless liquid, with fragrant smell. Is not acted upon by NaOH. Oxidised by KMnO₄ to cumunic acid.

**Oxim** C₆H₄(\text{CH}₂)₂CH₂CH₂(NH)₂CH₂ (57°). Long shining prisms (from ligroin).

**METHYL CYML KETONE**

C₆H₄(C₆H₅)₃PCl₂ [14°]. [253°]. S.G. 1.2575. Formed by the action of acetyl chloride on cymene in the presence of AlCl₃ (Withmann, B. 21, 2225).

**Oxim** C₆H₄(NH)₂CH₂Cl₂ (57°). Formed, together with CO₂, by distilling [8]-methyl-coumarilic acid. Oil, volatile with steam. Does not react with phenylhydrazine or phenylhydrazine. Di-methyl-coumarone C₆H₄(CHO)₂, i.e. C₆H₄(CHO)₂(\text{CH}2)₂\text{CH}=\text{O}. (210° at 728 mm.)

**METHYL CUMANE** v. **Cymanide in the article CYMANIC ACID.**

**METHYL CYANATE** v. **Cyanic acids.**

**METHYL-CYANETHINE** v. **Cyanethine.**

**METHYL CARBAMIDE** v. **Cyanic acids.**

**METHYL-CYANIC ACID** v. **Cyanic acid.**

**METHYL CYANIDES** v. **Acetonitrile and methyl cyanamide.**

**Di-methyl di-cyanide** C₆H₄N₂, i.e. N₂H₆C₆M₄CN or N₂H₆C₆M₄CN. [53°]. V.D. 42°. Formed by the action of dry sodium on acetonitrile dissolved in ether. Methane is evolved in the reaction, and the product is decomposed by water (Hollwag, J. pr. [2] 56, 343; 39, 210). White needles, v. sol. ether, alcohol, chloroform, benzene, m. sol. water, sl. sol. petroleum ether.

**Reactions.**—1. Boiling water liberates ammonia forming C₆H₄N₂O, a body which is converted by PCl₃ into crystalline C₆H₄N₂Cl (179°), which, on recrystallisation from water, becomes C₆H₄N₂Cl.——2. Acetyl chloride forms a compound C₆H₄(\text{CH}2)₂COCl₂, which on decomposition by water yields C₆H₄N₂Cl, crystallising in beautiful white needles [225°].——3. Warm dilute (26 p.c.) HCl forms NH₄Cl and an oil which has the composition of cyan-cyanate. It solidifies to a glassy mass, carbonyl-benzoic acid, [289°], and forms with phenylhydrazine a condensation product [57°].

**Tri-methyl tri-cyanide** v. **Cyanmethine.**

**METHYL-CYANO-FORMAMIDE** v. **Methyl-amine of Para-Cyanformic acid.**
**304 METHYL-CYANO-SUCCINIC ETHER.**

**METHYL-CYANO-SUCCINIC ETHER.** C₆H₅NO₂ i.e. CO₂Et,CH₂,CONH₂,CO₂Et. An oil formed by treating cyano-succinic ether with Na and MeI successively (Barthes, C. R. 108, 797).

s-Di-methyl-cyano-succinic ether C₆H₅NO₂ i.e. CO₂Et,CH₂,CONH₂,CO₂Et. (273) S.G. 221 1.0577. A product of the action of alcoholic KCl on a-bromo-propionic ether (Zelinsky, B. 21, 3104). Formed also by adding a-bromo-propionic ether to cyano-propionic ether mixed with KCl (Z.).

**METHYL-CYANURIC ACID v. Cyanuric acid in the article CYANIC ACID.**

**METHYL CYMYL KETONE C₆H₅O₂ i.e. CH₂CO,C₆H₅,Me,CO₂H, [2:4:1]. (217). An oil, formed by the action of AcCl on cymene in presence of AICl₃ (Claus, B. 19, 233).

**METHYL DAMBOSE v. BORNSMEU, vol. i, p. 524.**

**METHYL-DAMBOSE v. DAMBONITRE.**

**METHYL-DAPNETIN v. DAPNEKIN.**

**METHYL DECYL KETONE C₆H₅O₂ i.e. CH₃CO,C₆H₅,CH₂,CH₂,CO₂H, [2:1]. (217). Formed by distilling a mixture of barium acetate and barium benzoate (undecylate) (Krafft, B. 15, 1708). Yields acetic and decylic acids on oxidation.

**METHYL-DESOXYBENZONIN v. TOLYL BENZYL KETONE. Dimethyldesoxybenzoin v. BENZYL XYLAL KETONE.**

**METHYL DODECYL KETONE C₆H₅O₂ i.e. CH₃CO,C₆H₅,H,CO₂H, [34]. (206) at 100 mm.** Formed by distilling barium triacetate (C₆H₅O₂),Ba with barium acetate (Krafft, B. 15, 1708). Yields lauric and acetic acids on oxidation.


**Benzaol derivative. Hydrochloride C₆H₅NO₂,HCl.** The first product of the action of hydrochloric acid on methyl-cocaine [47], the base being just dissolved in HCl and then heated ½ hour at 90°. Glassy columns (from hot water). The base is not pptd. by carbonate of soda. Aurochloride C₆H₅NO₂,HCl,AgCl. The nitrate is v. st. sol. water.

**METHANLE.** The radical CH₂, which is not known to exist in the free state.

**Dimethyle C₆H₅ i.e. CH₂,CH₃ is called ETHYLENE (q. v.).**

**Trimethyle C₆H₅, i.e. CH₂,CH₃,CH₃ is called ETHYLENE (q. v.).**

**Trimethyle C₆H₅, i.e. CH₂,CH₃,CH₃ is called ETHYLENE (q. v.).**

When trimethylene bromide CH₃Br,CH₂Br,CH₃Br (140 g.) is boiled with sodium (6 g.), the contents of the flask become pasty, but still contain much of the bromide (130 g.), which can be mostly recovered by filtration (Frelund, J. pr. [2] 26, 207). It is also formed by heating trimethylene bromide with zinc-dust and 70 p. alcohol (Gustavson, J. pr. [2] 36, 300). Trimethylene burns with a bright flame and smells like butylene.

**Reactions.** 1. Trimethylene is readily absorbed by fuming HCl. The product is a-propyl isode, whereas propylene gives iso-propyl isode.

2. Trimethylene is very slowly absorbed by bromine; the product is trimethylene bromide (165°). Propylene is readily absorbed, forming propylene bromide. — 3. Conc. H₂SO₄ forms liquid hydrocarbons, and on diluting and distilling n-propyl alcohol is got (Wagner, B. 21, 1120).

**References.** trimethylene-carboxylic acids, trimethylene methyl ketone, and Phenyl trimethyle ketone.

**Tri methane** is a term also applied to the divalent radia CH₃CH₂.CH₃.

**Tetra-methylene** is a term applied to the ring CH₂,CH₂,CH₂,CH₂.

**Pentamethylene** is a name used to denote CH₂,CH₂,CH₂,CH₂,CH₂.

**Hexamethylene** is benzene hexahydrate. According to Baece (A. 258, 166), it should be regarded as lying entirely in one plane.


**Trimethylene-acetio-acetic acid** so-called, v. vol. i, p. 21.

**METHYL-DIAMINE Di-benzyl derivative CH₂,N₂ [291].** S. (alcohol) 47 at 14°; 63 at 22°; Hippuranin.

**Formation.** From hippuric acid, Ph₂Oₓ and HNO₂ or H₂SO₄ (H. Schwartz, A. 76, 201; Sitz. W. 77, ii. 762; J. Maier, A. 127, 103; Kraut a. Y. Schwartz, A. 223, 40).

**Preparation.** From benzointrile (15 g.), methylal (6 g.) and conc. H₂SO₄ (100 g.) (Hepp a. Spiess, B. 9, 1124).

**Properties.** Long white foiled needles (from alcohol), v. sol. CS₂, ether, and chloroform.


**Trimethylene-diamine C₆H₅,N₂, i.e. NH₂,CH₂,CH₂,CH₂,NH₂ (c. 140).** Formed by heating trimethylene bromide (1 mol.) and NH₂ (20 mols.) in alcohol for 10 hours at 100°. The liquid is decanted from NH₄Br and evaporated, treated with KOH and distilled (Fischer a. Koch, B. 17, 1799; Leimann a. Würthner, A. 225, 227). Colourless mobile liquid, easily miscible with alcohol, ether, and benzene. Bums in moist air, combining with water to form a
METHYLENE-DIAMINE

Hydrate. Readily takes up CO₂ becoming solid. Condenses with benzoic acid to form phenanthrene derivatives. Condenses with benzaldehyde forming chloroform, a yellow powder, melting above 200°.

Benzil forms CH₃N:CPh₂ a transparent vitreous mass (m. 78°).


Diglycerol derivative CH₃(NH₂)₅(OH). White crystalline powder, insol. water, sl. sol. benzene, v. sol. alcohol and chloroform.

On heating in a stream of HCl the product is CH₃N:CPh₂, an oily base which slowly becomes crystalline and forms crystalline salts (Hofmann, B. 21, 2337).

Oxalyl derivative CH₃N:CPh₂. A sparingly soluble white powder, formed on mixing trimethylene-diamine with an alcoholic solution of methyl oxalate. It does not melt below 250°.

Derivative. V. Oxy-Tri-Methylene-Diamine.

Trimethylene di-nitro-di-amine CH₃N₂O₂, i.e. NO₂.NH.CH₂.CH₂.CH₂.NH₂. Formed by heating CH₃N₂O₂,_(v. Trimethylene diamide) with aqueous ammonia (Franchinmont a. Klobb, R. T. C. 7, 343). Short thick prisms (from water or alcohol), v. sol. water and alcohol, less sol. ether and chloroform. Boiled with dilute (2 p.c.) H₂SO₄ it evolves N₂. It has no acid reaction, and easily forms metallic derivatives.

Tetra-methylene-diamine CH₃N₂. Obtained by reducing ethylene cyanide in alcoholic solution with sodium (Landor, B. 19, 790). Isomeric with the ptomaine 'pyruvostine' (cf. L. Brigger, 'Die Ptomaine,' Berlin, 1885-1886, 43, 301) and also with a base obtained from a morbid urine (Udranszky a. Baumann, B. 21, 2938). Strong base, smelling like piperidine. Solutions of its salts give a crystalline ppt. with iodine dissolved in KIaq but not with HgCl₂ or KC₄I. When shaken with aqueous NaOH and BaCl₂ it gives a crystalline ppt. of the di-benzoxyl derivative. Methyl chloroformate Cl₂O₆Me forms (CH₃N₂O₂),_ which crystallises in flattened needles (128°), sl. sol. cold water, and is nitratated by HNO₃, yielding (CH₃N₂O₂)₂C₂O₄Me, which crystallises from ether and melts at 61° (Dekkers, R. T. C. 9, 97).

Salts. B₃H₅Cl₂. Plates (from alcohol).


Tetra-methylene-di-nitro-di-amine CH₃N₂O₂, i.e. [CH₃(NH₂)₂]NO₂ (189°). Got by heating (CH₃)₃(NH₂)₂, with conc. NH₄NO₃ at 100° and ppg. by HOAc (D.). Small hard crystals (from water).

Penta-methylene diamine CH₃NH₂ i.e. NH₃.CH₃.CH₂.CH₂.CH₃NH₂ (175°-165°) (Perkin, C. J. 55, 699). S. C. 9174 (L.) (1/1000-1/854, 1/2-8784. M. M. 7498 (L)). Formed from trimethylene cyanide by reduction in ethereal solution with zinc and HCl, or in alcoholic solution with sodium (Ladenburg, B. 16, 1151; 18, 2956; 19, 780, 2858). It is identical with 'cadaverine' a base discovered by Brügger in corpses, and among the products of putrefaction of flesh and fish (Brügger, B. 16, 1186, 18, 1922; 'Die Ptomaine,' Berlin, 1885; Ladenburg, B. 10, 2853). Found also in the urine of a patient suffering from cystinuria, but not in normal urine (U. a. B. P. Syrup, smelling like piperidine; v. sol. water and alcohol, m. sol. ether. Fumes in the air. Absorbs CO₂ from the air. The hydrochloride is converted by dry distillation into NH₃, HCl and piperidine.

Salts. B₃H₅Cl₂-B₃H₅P₂O₅. Thick orange prisms (from water); m. sol. cold water. Periodic acid. Almost black crystals (from alcohol).

B₃H₅Cl₂.H₂SO₄. Crystals (from hot water).

B₃H₅Cl₂.4H₂Cl₂. Crystals (from alcohol).

Di-acetyl derivative CH₃(CH₃CH₂NH₂). Small needles (from alcohol). May be distilled.

Di-benzoxyl derivative CH₃(CH₃CH₂NH₂). Above 300°. Ppd. by adding aqueous NaOH and BaCl₂ to a solution of the base (Udranszky a. Baumann, B. 21, 2744). Long needles and plates; v. sol. alcohol, m. sol. ether, insol. water. Not affected by hot acids or alkalis.

Penta-methylene di-nitro-di-amine CH₃(CH₃CH₂NH₂). Formed by treating CH₃(CH₃CH₂N₂O₂),_ with aqueous ammonia (Franchinmont a. Klobb, R. T. C. 7, 343). Small oblong plates (from chloroform); v. sol. water and alcohol, m. sol. ether, sl. sol. chloroform. When boiled with dilute (3 p.c.) H₂SO₄ it evolves N₂O₅.

Di-nitrose-penta-methylene-tetramine (so-called) CH₃(CH₃CH₂N₂O₂, i.e. CH₃N₂O₂) (207°) (G.); (208°) (M.). Formed by the action of nitrous acid on 'hexamethylene tetramine' (Gries, B. 21, 2736; Mayer, B. 21, 2988). Needles (from alcohol). v. sol. hot alcohol, m. sol. chloroform, insol. ether. Not affected by boiling with zinc dust. Dilute HCl decomposes it into nitrogen, ammonia, and formic acid.

Hexa-methylene-tetramine (so-called) CH₃N₂, Hexamethyleneammonium (1897). S. (alcohol) 7. Mol. w. 115 (by Raoului's method) (calc. 140) (Tollens a. Mayer, B. 21, 1566). Formed by passing dry NH₃ over heated tri- oxy-methylene (formic paraldehyde) (Butlerow, 4. 119, 533; Z. 25, 278). Prepared by dissolving methyal in dilute H₂SO₄, and distilling the product with steam into a receiver containing ammonia (Wohl, B. 19, 1849).


Reactions. — 1. Split up by boiling dilute...
METHYL-CYANO-SUCCINIC ETHER.

C₆H₅NO₂ i.e. CO₂Et.CH₂.CN.OEt.CO₂Et. An oil formed by treating cyano-succinic ether with Na and Me₃ successively (Barthes, C. R. 108, 297).

s-Dimethyl-cyano-succinic ether C₆H₅NO₂ i.e. CO₂Et.CH₂.CN.OEt.CO₂Et. (273°), S.G. 1.0577. A product of the action of alcoholic KCl on a-bromo-propionic ether (Zelinsky, B. 21, 3104). Formed also by adding a-bromo-propionic ether to cyano-propionic ether mixed with KCl (2).

METHYL-CYANURIC ACID v. Cyanoacetic acid in the article CYANO ACIDS.

METHYL CYMYL KETONE C₃H₆O i.e. CH₃.CH₂.CO₂C₂H₅, [2:1:4]. (217°). A product of the action of ACl on cymene in presence of AlCl₃ (Claus, B. 19, 233). Formed also by adding a-bromo-propionic ether to cyano-propionic ether mixed with KCl (2).

METHYL DAMBONE v. BORNSMITH, vol. i, p. 524.

Bis-methyl-dambone v. DAMBONITE.

METHYL-DAPHNETIN v. DAPHNETIN.

METHYL DECYKETONE C₃H₆O i.e. CH₃.CH₂.O.CO₂C₂H₅, [217°]. (217°). Formed by distilling a mixture of barium acetate and barium benzoate (deutecate) (Kraft, B. 15, 1708). Yields acetic and decon acid oxides on distillation.

METHYL DE-SOXOZENZIN v. TOLYL BENZYL KETONE.

Dimethyls demanding benzoin v. BENZYL XYL KETONE.

METHYL DODECYL KETONE C₁₃H₂₅O i.e. CH₃.C₂H₅.CH₂.O.CO₂C₂H₅, [34°]. (268° at 100 mm.). Formed by distilling barium tridecanate (C₁₃H₂₅O₂Ba with barium acetate (Kraft, B. 15, 1708). Yields lauric and acetetic acid oxides on distillation.


Benzaldehyde derivative. Hydrochloride C₆H₅.NO₂.HCl. The first product of the action of hydrochloric acid on methyl-cocaine [47°], the base being just dissolved in HCl and then heated ½ hour at 90°. Glassy columns (from hot water). The base is not ppd. by carbonate of soda. - Acrochloride C₆H₅.NO₂.HCl.AcCl. The nitrate is v. st. sol. water.

METHYLENE. The radical CH₂, which is not known to exist in the free state.

Dimethylene C₆H₄ i.e. CH₂.CH₂.CH₃ is called ETHYLENE (q. v.).

Trime-thylene CH₃ i.e. CH₂.CH₂.CH₃ is called ETHYLENE (q. v.).

H.F.P. -470. H.F.V. -4650. This gas is formed when trimethylene bromide CH₂Br.C₂H₅.CH₂Br (140 g.) is boiled with sodium (6 g.). The contents of the flask become pasty, but still contain much of the bromide (130 g.), which can be mostly recovered by filtration (Frensd. J. pr. 26, 207). It is also formed by heating trimethylene bromide with zinc and dust and 75 p.c. alcohol (Gustavson, J. pr. 26, 300). Trimethylene burns with a bright flame and smells like butylene.

Reactions.—1. Trimethylene is readily absorbed by fuming HI. The product is n-propyl iodide, whereas propylene gives isopropyl iodide.

2. Trimethylene is very slowly absorbed by bromine; the product is trimethylene bromide (165°). Propylene is readily absorbed, forming propylene bromide. — 3. Conc. H₂SO₄ forms liquid hydrocarbons, and on diluting and distilling n-propyl alcohol is got (Wagner, B. 21, 1239).

References.—TRIMETHYLENE CARBOXYLIC ACIDS, TRIMETHYLEYL METHYL KETONE, and PHENYL TRIMETHYLEYL KETONE.

Tri-methylene is a term also applied to the diethyl radical CH₂.CH₂.CH₃.

Tetra-methylene is a term applied to the ring CH₂.CH₂.CH₂.CH₂.

Pentamethylene is a name used to denote CH₂.CH₂.CH₂.CH₂.CH₂.

and also CH₂.CH₂.CH₂.CH₂.CH₂.

Hexamethylene is benzene hexahydride. According to Lecera (A. 268, 166), it should be regarded as lying entirely in one plane.


METHYLENE-DIAMINE Di-benzyl derivative CH₂(NH₂)₂, [291°]. S. (alcohol) 47 at 14°; 63 at 22°; Hiphoparin.

Formation.—From hippuric acid, PhO₂ and HNO₃ or H₂SO₃. (H. Schwartz, A. 75, 201; Sitz. W. 77, II. 762; J. Maier, A. 127, 103; Kraut a. Y. Schwartz, A. 223, 40).

Preparation.—From benztonitrile (15 g.), methylal (6 g.) and conc. H₂SO₄ (100 g.) (Hepp a. Spiess, B. 9, 1124).

Properties.—Long white foiled needles (from alcohol), v. sol. CS₂, ether, and chloroform.


Trimethylene-diamine C₅H₈N₂, i.e. NH₂.CH₂.CH₂.CH₂.NH₂, [14°]. Formed by heating trimethylene bromide (1 mol.) and NH₃ (20 mols.) in alcohol for 10 hours at 100°. The liquid is decanted from NH₄Br and evaporated, treated with KOH and distilled (Fischer a. Koch, B. 17, 1799; Lessmann a. Würtz, A. 228, 227). Colourless mobile liquid, easily miscible with alcohol, ether, and benzene. Fumes in moist air, combining with water to form a
**TRIMETHYLENE CARBOXYLIC ACID.**

\[ 
\text{C}_2\text{H}_2\text{O}_2 \text{H} \quad \text{(Fischer a. Koch, A. 232, 233). It crystallises after some time, and separates from ethyl colourless prisms, v. sol. ether, alcohol, and chloriform, sol. sol. ligroin, insol. water. It dissolves in acids but is reppled by alkalis.} 
\]

Tetramethylene dicarboxylic acid. *Methyl* ether \( \text{C}_2\text{H}_2\text{(NH.CO.Mo)}_2 \) (1892). Formed from tetramethylene-diamine and \( \text{Cl.CO.Mo} \) (Dekkers, R. T. C. 8, 97). Flattened needle, sol. warm water. Converted by \( \text{HNO}_3 \) into \( \text{C}_2\text{H}_2\text{(NH.CO.Mo)}_2 \), which separates from ether in small brilliant crystals (62°), v. sol. cold water, sol. ether, sol. warm alcohol, and is converted by \( \text{H}_2\text{N}_2\text{H}_2 \) into \( \text{C}_2\text{H}_2\text{(NH.CO.N)}_2 \) (1639).

Pentamethylene dicarboxylic acid. *Methyl* ether \( \text{C}_2\text{H}_2\text{(C.H.CO.Mo)}_2 \) (114°). Formed by treating penta-methylene-diamine with methyl carbonate. Fine needles (from boiling water). V. sol. hot alcohol (Franchimont a. Klobbie, R. T. C. 7, 318). Pure \( \text{HNO}_3 \) gives a di-nitro-derivative, forming small brilliant prisms (37°); and this treated with aqueous ammonia gives penta-methylene-dinitramine (69°) together with methyl carbamate.

**TRIMETHYLENE CARBOXYLIC ACID**

\[ 
\begin{align*} 
\text{CH}_2\text{CO}_2\text{H} & \quad \text{or} \\
\text{CH}_2\text{CO}_2\text{H} & \\
\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H} & \quad \text{Isomeride of erotic acid.} \\
\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H} & \quad \text{Formed by heating ethylene-malonic acid (trimethylene dicarboxylic acid) at 210°} \quad \text{(Kröder, A. 227, 24); Perkin, jun., C. J. 47, 817; B. 17, 57). White crystals, m. sol. water. Has a powerful odour and a burning taste.}
\end{align*} 
\]

C₃H₅O₂, i.e. \[ \text{CH}_2\text{CO}_2\text{H} \quad \text{CH}_2\text{CO}_2\text{H} \]


**Ethyl ether** EBA. (134°). Formed by digesting the Ag salt with an ethereal solution of EtI. Volatile oil, with pleasant odour. Not affected by bromine in the cold, and only slowly attacked when boiled with bromine, HBr being given off.

**Trimethylene (1:1)-di-carboxylic acid** called \[ \text{C}_2\text{H}_2\text{O}_2 \text{H} \quad \text{C}_2\text{H}_2\text{O}_2 \text{H} \]

\[ 
\begin{align*} 
\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H} & \quad \text{Vinacetic acid. Ethylene-malonic acid.} \\
\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H} & \quad \text{0-77121:1-8702. Crystallises with aq (from water); v. e. sol. water, v. e. sol. ether. At 160° it begins to give off CO₂ leaving trimethylene carboxylic acid. It is not attacked by sodium- amalgam: When heated with bromine it gives off HBr slowly. It combines, however, with HBr, forming bromo-ethyl-malonic acid (Perkin, C. J. 47, 814), and it combines with bromine when this is dissolved in chloroform (Fittig). Boiling dilute H₂SO₄ forms γ-oxy-ethyl-malonic acid. Alkaline KMnO₄ does not attack it (Bochner, B. 28, 704).} 
\end{align*} 
\]


**Ethyl ether** \( \text{CH}_2\text{CO}_2\text{H} \) (218°). V. D. 0.92 (calc. 0.93). S.G. \[ \frac{4}{3} \cdot 0.9646; \frac{4}{3} \cdot 1.0586. \] Formed by the action of ethylene bromide on sodium-malonic ether (Perkin, jun., C. J. 47, 819; B. 17, 54; Fittig a. Röder, A. 227, 18). Oil. Not attacked when successively treated with benzyl chloride and NaOEt (Perkin, jun., B. 18, 1784). **Dibromo** \( \text{C}_2\text{H}_2\text{Br}_2\text{(COH)} \) (110°). From triethylenedi-carboxylic acid and Br in chloroform (Fittig a. Marburg, B. 18, 3419).

**Trimethylene (1:2)-di-carboxylic acid**

\[ 
\begin{align*} 
\text{CH}_2\text{CO}_2\text{H} & \quad \text{or} \\
\text{CH}_2\text{CO}_2\text{H} & \\
\text{CH}_2\text{CO}_2\text{H} & \quad \text{Allo-itaconic acid.} \quad \text{[137°]} \quad \text{(C. a. G.); [139°]} \quad \text{(B.).}
\end{align*} 
\]

**Formation.** - 1. By heating its anhydride with water at 140° (Conrad a. Gutschitz, B. 17, 1187). - 2. From sodium propionate-tertcarboxylic ether (CO₂Et), Na₂CN, CH₃CO₂Et, by treatment with bromine, the resulting trimethylene tetra-acrylic ether being saponified, and the free acid heated to 230°, and then distilled under 16 mm. pressure: the oil which passes over at 170° to 180° is heated with water at 140° (Perkin, jun., B. 19, 1066; Dressel, A. 266, 197).

**Properties.** - Prisms; v. sol. water, alcohol, and ether. Not attacked by alkaline KMnO₄ or by sodium-amalgam (Bochner, B. 23, 705).

**Salts.** - Ca²⁺: silky crystals. - Ag⁺aq.

**Anhydride** \( \text{C}_2\text{H}_2\text{O}_2, \text{i.e. CH}_2\text{CO}_2\text{H} \)

\[ 
\begin{align*} 
\text{CH}_2\text{CO}_2\text{H} & \quad \text{or} \\
\text{CH}_2\text{CO}_2\text{H} & \\
\text{CH}_2\text{CO}_2\text{H} & \quad \text{Buchner. Formed by heating trimethylene-} \\
\text{CH}_2\text{CO}_2\text{H} & \quad \text{tricarboxylic acid CH₂(CO₂H), or possibly} \\
\text{CH}_2\text{CO}_2\text{H} & \quad \text{at 124° to 109° for a long time (C. a. G.)}. \\
\text{CH}_2\text{CO}_2\text{H} & \quad \text{Needles, sol. ether.}
\end{align*} 
\]

**Trimethylene (1:2)-di-carboxylic acid**

\[ 
\begin{align*} 
\text{C}_2\text{H}_2\text{CO}_2\text{H} & \quad \text{or} \\
\text{C}_2\text{H}_2\text{CO}_2\text{H} & \quad \text{[175°]; I-cis-trans-tri-methyl-} \\
\text{C}_2\text{H}_2\text{CO}_2\text{H} & \quad \text{1-2-di-carboxylic acid.} \quad \text{Formed by saponification of the di-methyl-ether (Edvard Bochner, B. 23, 705). Compact apparently rhombic crystals (from water), containing no water of crystallisation. Grouped needles (from ether). Less sol. water than the isomeric glutaric acid, but more sol. ether. Distills without splitting off water. Acetyl chloride forms no anhydride. Not oxidised by permanganate in alkaline solution. Not reduced by sodium-amalgam. Chloride of iron gives a weakly brown colour.}
\end{align*} 
\]

**Salts.** - The zinc salt is more sol. cold than hot water. It crystallises in nodular groups of needles. A solution of the ammonium salt gives no pp. with CaO₂ and BaO₂, but while crystalline pps. with silver and lead salts. By heating the silver salt a white body sublimes in needles, probably the anhydride.

**Di-methyl-ether** \( \text{CH}_2\text{CO}_2\text{H} \) (905°-925° at 718 mm.). Formed by heating aerylido-di-azo-acetic ether \( \text{C}_2\text{H}_2\text{N(CO₂H)} \) for 40 minutes to 160°-185°. Saponified by boiling with aqueous potash.
TRIMETHYLENE CARBOXYLIC ACID.

Isomers of trimethylene dicarboxylic acid are: Trisuccinic, Trisacrylic, Trisacrylic, and Glutaric acids.

**Trimeylene (1:1:2): tri-carboxylic acid**

\[
\text{CH}_3\text{C(CO}_2\text{H)}_2\text{C}(\text{CO}_2\text{H})_2 \quad \text{(184°). Formed by saponification of its ether, which is prepared by the action of 2,4-dibromo-propionic ether on dibromo-monatomic ether (Conrad a. Gutsche, 21, 178). Its ether is also formed by the action of carbon-substituted propionic ether on dibromo-monatomic ether (Michael, J. pr. 2, 35, 123, 351; 3, 9, 121). Prisms from water. At 179° it is split up into CO}_2\text{ and the dicarboxylic acid and its anhydride.**}

**Tri-ethyl ether Et<sub>3</sub>N<sub>2</sub>** (276°). S.G. 1.127. Colourless liquid. Does not react with NaOEt and BaO.

**Trimeylene (1:2:3): tri-carboxylic acid**

\[
\text{CH}_3\text{C(CO}_2\text{H)}_2\text{C}(\text{CO}_2\text{H})_2 \quad \text{or possibly}
\]

\[
\text{CO}_2\text{H-CH-CH-CH}_3\text{CO}_2\text{H} \quad \text{[160°-153°]. Formed by heating the tetra-carboxylic acid (1:1:2:3) at 200° for a long time (Perkin, B. 17, 1654; C. J. 47, 826). Colourless crystalline solid. V. sol. water, alcohol, and acetone, al. sol. benzene, chloroform, ligroin, and CS<sub>2</sub>. On heating it yields a sublime, probably of an anhydride.**}

**Salts.** A<sup>2+</sup>Ag: white granular pp. — A<sup>2+</sup>Ca: crystalline pp., soluble in cold water, nearly insoluble in hot. The cupric salt is a beautiful light-green pp., al. sol. water. The Ba and Pb salts are white pps.

**Trimeylene (1, 2, 3): tri-carboxylic acid**

\[
\text{CH}_3\text{C(CO}_2\text{H)}_2\text{C}(\text{CO}_2\text{H})_2 \quad \text{[230°]. Obtained by saponifying its methyl ether with alcoholic potash (Buchner, B. 21, 2641). Small aggregates of crystals (from ether), v. sol. alcohol and water, al. sol. ether. Not affected by bromine or by KMnO<sub>4</sub>. Its ammonium salt crystallises in plates.**}

**Methyl ether Me_2A<sup>-</sup>.** (61%). (267°) at 732°; (224° at 150°). Obtained by distilling the compound of methyl furan and methyl diazo-acetate. Needles (from alcohol or water), v. sol. alcohol, ether, benzene, and petrolatum-ether.

**Anhydride CH<sub>2</sub>(CO<sub>2</sub>H)<sub>2</sub>COO.** (189°). (265° at 75 mm.). Obtained by distilling the acid under reduced pressure. Small prisms, v. sol. water and alcohol, al. sol. ether. Its Pb, Ba, and Ag salts are m. sol. water.

**Trimeylene (1, 1, 2, 3): tetra-carboxylic acid**

\[
\text{CH}_3\text{C(CO}_2\text{H)}_2\text{C}(\text{CO}_2\text{H})_2 \quad \text{or possibly}
\]

\[
\text{CH}_3\text{C(CO}_2\text{H)}_2\text{C}(\text{CO}_2\text{H})_2 \quad \text{[98°-100°]. The tetra-ethyl ether of this acid is obtained by the action of di-bromo-succinie ether on di-sodium-monatomic ether (Perkin, B. 17, 1652; C. J. 47, 824). Crystalline colourless solid. V. sol. water, alcohol, ether, and acetone, al. sol. ligroin and benzene. Very strong acid. The acid loses CO}_2\text{ on heating to 200° giving the (1, 2, 3)-tri-carboxylic acid.**}

**Salts.** A<sup>2+</sup>Ag: white amorphous pp. — A<sup>2+</sup>Ca: crystalline pp., more soluble in cold water than in hot.**

**Tetra-ethyl ether A<sup>2+</sup>E<sub>2</sub>;** (246° at 85 mm.); thick colourless oil.

**Tri-ethyl ether** (1, 1, 2, 3): tetra-carboxylic acid CH<sub>3</sub>C(CO<sub>2</sub>H)<sub>2</sub>COO. (200°). Formed by saponifying the ethyl ether with alcohol in KOH (Dressel, A. 266, 196). Large shining crystals (from water). When heated to 200° it gives off CO<sub>2</sub> and H<sub>2</sub>O and is converted into the anhydride of trimethylene dicarboxylic acid, and from this the dicarboxylic acid itself can be obtained by heating with water to 140°.


**Tetra-methylene carboxylic acid CH<sub>2</sub>COOH** i.e. CH<sub>2</sub>CH<sub>2</sub>COOH. (191°) at 720 mm. S.G. 1.0548; β 1.0476. M.M. 5.048 at 18°. µ<sub>µ</sub> 1.4043 at 25°. Formed by heating tetra-methylene dicarboxylic acid at 200°, CO<sub>2</sub> being given off (Perkin, B. 16, 1795; C. J. 51, 8). Colourless oil, smelling like butyric acid; al. sol. water, miscible with alcohol and ether. Not attacked by bromine below 100°.

**Reaction.** The calcium salt, distilled with lime gives CH, H<sub>2</sub>, CH, CO, di-tetramethylene ketone, and tetramethylenyl methyl ketone (Colman a. Perkin, jun., C. J. 51, 228; B. 19, 3119).

**Salts.** A<sup>2+</sup>Ca: sparingly soluble white pp. —

**Oxo<sup>2+</sup>Ca:** (56°).

**Ethylic ether A<sup>2+</sup>Et** (151°) at 720 mm. (P.); (108°) (Freund, B. 21, 2604).

**Chloride CH<sub>2</sub>COCl.** (143°) (F.). Obtained by heating the amide with POL.**

**Amide CH<sub>2</sub>HCONH.** (138°). (c. 240°). Formed by heating the ammonium salt of the acid to 250° (Freund, B. 21, 2604). Plates (from alcohol), v. sol. water, ether, chloroform, benzene. May be sublimed. Decomposed by treatment with bromine and KOH.

**Nitride CH<sub>2</sub>H<sub>2</sub>CN.** (160°). Formed by distilling the amide of tetra-methylene carboxylic acid with phosphoric anhydride (Freund, B. 21, 2696). Colourless oil, with pleasant odour. Is converted into the amine by reducing with sodium and alcohol.

**Amidele CH<sub>2</sub>HCONHPh.** (111°). Formed by heating the amide with aniline until no more ammonia is given off (Freund). Long needles (from alcohol), al. sol. hot water.

**Anhydride (CH<sub>2</sub>HCO<sub>2</sub>.)** (160°). Formed by distilling the sodium salt with the chloride of the acid (F.).

**Tetra-methylene (1, 1): dicarboxylic acid**

\[
\text{CH}_3\text{C(CO}_2\text{H)}_2\text{C}(\text{CO}_2\text{H})_2 \quad \text{[156°]. From the ether (Perkin, C. J. 51, 4). Monoclinic crystals (from ether); a:b:c = 1.0384:1.1864; α = 89° 55′. V. sol. ether and benzene, nearly**

```text
[Image]
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insol. chloroform and ligroin, v. sol. water. A few degrees above its melting-point it is splits off CO₂, becoming tetramethylene carboxylic acid.

**Salts.** — Ag₂A'' — Cu₄A'' — Pb₄A'' — Ba₄A''

- *Ethyl ether E₄A''.* (221°) at 720 mm. S.G. 1.0668; 4 - 1.0465. M.M. 9940 at 18-9°. 4 - 1.438. Formed from maleonic ether, trimethylene bromide, and NaOEt (Perkin, B. 18, 1798; C. J. 51, 2). Oil, smelling like camphor.

**Tetramethylene (1,2)-di-carboxylic acid**

\[ \text{CH₂OCH₂(OH)} \quad \text{[150°]} \]

Formed by heating CH₂OCH₂(CO₂H), the tetra-carboxylic acid to 180°-200° (Perkin, B. 19, 2042; C. J. 51, 22). Colourless feathery crystals (from water). V. sol. hot water, alcohol, and ether, more sparingly sol. benzene and ligroin. By alkaline KMnO₄, it is oxidised to oxalic acid.

**Salts.** — Ag₂A''; heavy white pp. — Ba₄A''; sparingly soluble six-sided transparent tablets.

- *Diethyl ether A''E₄A''.* (238°-242°); colourless liquid.

**Anhydride**

\[ \text{CH₃COCH₃O} \quad \text{[78°]} \]

colourless crystals; easily soluble in alcohol, sparingly in ether and benzene. Formed by heating the acid to 300°. Reconverted into the acid by boiling with water. Heated with resin it gives a magnesium flor坐con composition-product.

**Tetramethylene (1,2)-di-carboxylic acid**

\[ \text{CH₂OCH₂(OH)} \quad \text{Homotesinic acid.} \quad \text{[171°]} \]

Formed by boiling its ether with fuming HClaq (Markownikoff a. Krestownikoff, A. 206, 333). Prisms, v. sol. hot water and alcohol, al. sol. ether. May be sublimed. Does not combine with bromine, but when heated with Br₂ it gives off HBr and CO₂. It is not reduced by sodium-amalgam. Does not form an anhydride. Does not unite with HBr or HI.

**Salts.** — Pb₄A''aq. Crystalline crusts. — Ag₂A''. Amorphous pp., not decomposed by boiling water.

- *Methyl ether Me₂A''.* (290°).

- *Ethyl ether E₄A''.* (230°). Formed in very small quantity when CH₂OCH₂(OE₄).CO₂Et is prepared by the action of dry NaOEt on a chloro-propionic ether (M. a. K.).

**Tetramethylene (1,2,2) - tetra-carboxylic acid**

\[ \text{CH₃COCH₂(OH)} \quad \text{[145°-150°]} \]

 Obtained by

- saponification of the tetra-ethyl ether, which is formed by the action of bromine upon the di-sodio- derivative of butane-tetra-carboxylic acid.

\[ \text{CH₂OCH₂(CO₂Et)} \]

ether (Perkin, B. 19, 2041; C. J. 51, 91). Colourless crystals. Easily soluble in water, alcohol, and ether, more sparingly in benzene and ligroin. It evolves CO₂ at its melting-point, and is converted into the di-carboxylic acid.

**Tetramethylene (1,1,2,3) - tetra-carboxylic acid.**

- **Ethyl ether**

\[ \text{(CO₂Et)} \quad \text{[160°]} \]

Formed by the action of methylene iodide on the di-sodium de-

**Pentamethylenediacarbonyl acid**

\[ \text{CH₃COCH₂H} \quad \text{[160°]} \]

**Preparation.**—Disodium pentane tetra-carboxylic ether,

\[ \text{(CO₂Et)} \quad \text{CNaCH₂CH₂CNa(CO₂Et)} \]

converted by Br into CH₂OC(O₂Et)CNaCH₂CO₂Et, which yields pentamethylene tetra-carboxylic acid on saponification, and this acid is decomposed by heat into CO₂ and pentamethylene dicarboxylic acid. This is purified by conversion into its ethyl salt (Perkin, jun., C. J. 51, 244; B. 13, 3920).

**Properties.**—Nodules (from water). V. sol. hot water, alcohol, and ace et ether; al. sol. ether.

**Salts.** — Ag₂A''. Very stable white pp.

- *Ethyl ether E₄A''.* (250°).

**Anhydride**

\[ \text{CH₃COCH₂H} \quad \text{[64°-67°]} \]

Formed by heating the acid to 800°. M. sol. alcohol and ether, al. sol. Cs.; insol. cold, but saponified by hot, Na₂CO₃aq. With resorcin and HSO₃, it gives the florescent reaction.

**Penta-methylene tetra-carboxylic acid**

\[ \text{CH₃-C(CO₂H)} \quad \text{[66°-77°]} \]

**TETRAMETHYLENE-CARBOXYLIC ALDEHYDE HYDRE**

\[ \text{CH₂C(OH)-CH.CIO.} \quad \text{[115°-117°]} \]

Formed from calcium tetramethylene carboxylate by distilling with calcium formate (Colman a. Perkin, C. J. 51, 238). Oil; smelling like isobutyric aldehyde. Gives a purple colour with roseaniline hydrochloride which has been bleached by SO₃; reduces ammonical AgNO₃aq.; combines with NaHSO₃; reacts with hydroxylamine and with phenyl-hydrazine.

**TRIMETHYLENE CHLORHYDRIN v. CHLORO-PROPYLE ALCOHOL**


**Preparation.**—Aqueous HCl is cautiously added to a mixture of alcohol (6 vols.), chloroform (1 vol.), and zinc. Sufficient heat is pro-
METHYLENE CHLORIDE.

Diacetylene in the reaction to distil over much of the methylene chloride. The product is fractionally distilled (Greene, C. R. 86, 1077; A. Ph. S. 18, 347; C. N. 50, 75; A. C. J. 1, 292).

Properties. — Oil. Like CCI₃ (but unlike CH₂Cl and CH₂Cl₂) it exerts a poisonous action when inhaled (Regnault a. Villejeux, C. R. 100, 1146).


TRIMETHYLENE CHLORIDE v. α, β-DICHLORO-PROPANE.

METHYLENE CHLORO-BROMIDE v.

CHLORO-BROMO-METHANE.

Tri-methylene chloro-bromide v. CHLORO-BROMO-PROPANE.

METHYLENE CHLORO-IODIDE CH₂ClI;

Chloro-iodo-methane. (199°). V. D. 88-14. S. G. 40 2447; 125 2444. Formed by the action of ICl on methylene iodide or of iodine on HgCl₂ (Sakurai, C. J. 41, 361; 47, 195).

TRIMETHYLENE CYANHYDRIN v. Nitrile of α-OXY-BUTYRIC ACID.

Tri-methylene cyanide CH₂CN, i.e. Glutaraldehyde (274°) (H); (296°) (Perkin, C. J. 55, 702); (305° at 100 mm); (142° at 10 mm) (Kraft a. Neurlinger, B. 29, 717). S. G. 40 9952; 125 9904. M. M. 5135 (P.). Formed from trimethylene bromide and alcholic KC₅ (Henry, B. 2 [48, 618; C. R. 100, 742]. Liquid, solid, water, alcohol, and chloroform, insol. ether and CH₃OH. Yields glacial acid on saponification. Sodium reduces it in alkaline solution to pentamethylene-diamine and piperidine.

TRIMETHYLENE-DI-ETHYL-ALKINE v.

ETHYL-OXYPHOXY-AMINE.

METHYLENE-ETHYL-AMINE CH₂N; i.e. EtNCH₂R (208° i. V.). V. D. 2. Formed by the action of ethylamine on formic aldehyde (trioxymethylene) (Kolotoff, B. 2 [48, 112; J. 1921, 203]. Liquid with unpleasant odour, sol. cold water, but separates again on warming, sol. alcohol. HCl splits it up into ethylamine and trioxymethylene (formic paraaldheyde). — B H₃P₃Cl₃. Yellow crystalline pp. An isomeride (CH₃N)₂Et of this base is described by Lernmonoff (B. 7, 1526) as an oil formed by heating

ethylenediamine with alcoholic methylene iodide at 100°. (CH₂)₃NEtH₃P₃Cl₃. Amorphous.

Methylenetetra-ethyl-diamine C₃H₇N₂ (166° i. V.). S. 10. Formed by heating trioxymethylene (formic paraaldheyde) with diethylamine in sealed tubes at 100° (Kolotoff, B. 2 [43, 112; Ehrnberg, P. J. 36, 118). Liquid, with peppery odour, sol. water, miscible with alcohol, ether, and CHCl₃. Split up by dilute acids, even by oxalic acid, into NH₃Et and formic aldehyde. Combines with CH₃, forming C₃H₇N₃CS₃.

Tetra - methylene - tetra - ethyl - tetratetramer C₃H₇N₂, i.e. CH₄<CH₂(NEt₂)<CH₂>NH₂; Formed by heating methylene iodide with alcoholic ethylenediamine at 100° (Lernmonoff, B. 7, 1252). Liquid, yielding amorphous salts. — B H₃P₃Cl₃: sol. water.

METHYLENE - ETHYL - PHTHALIMIDINE C₇H₇N₂O i.e. C₇H₇<COH₃ (162°). Formed by heating C₃H₆N₂O₃ which is produced by adding aqueous ethylenediamine to phenyl-aetic acid (Mertens, B. 19, 239). Colourless oil, smelling of fresh carrots. Volatile with steam; sol. alcohol and ether.

METHYLENE DI-ETHYL DISULPHIDE C₃H₇S₂, i.e. CH₃(SeS₂)₃, Formic aldehyde ethyl succinit. Ethyl derivative of di-thio-formic orthoaldehyde. (178°-181°). S. G. 2.987. Formed from methylene chloride and Na₂S₃ in alcohol solution (Niederist, A. 186, 391; Fromm, A. 253, 155).

METHYLENE DI-ETHYL DISULPHONE C₃H₇S₂O i.e. CH₃(SO₂)₂Et (104°). Formed by the action of KMnO₄ and H₂SO₄ on CH₃S₂O₃ (Fromm, A. 253, 156; cf. Baumoff, B. 19, 2811). Needles, v. sol. water and alcohol, sol. ether. Chlorine forms CCl₃(SO₂)₂Et [99°] crystallising in needles; while bromine produces CBr₃(SO₂)₂Et [132°].

Di-methylene-di-ethyl trialsulphone (Et₂SO₃)₂CH₃SO₂Et (149°). Formed by treating formic aldehyde with HS, dissolving the product in aqueous NaOH, shaking with EtBr, and oxidising the product with KMnO₄ (Baumoff, B. 23, 1875). Sparingly soluble colourless needles.

METHYLENE-FURFURANE TRIHYDRAZIDE CH₃C(CH₃)

C₃H₄O i.e. CH₂<CH₂OH (111°) at 718 mm


METHYLENE ACETYL ETHER B. (C₃H₄O)₂

Tr. (194°). S. G. 1.0652 (Z); 1.0636 (P). G. 0°-10° -0.0060. S. V. 84 (Zander, A. 214, 178; Lasten, A. 254, 50). One of the products of the fermentation of glycerine by echinomyceetes (Frend, M. 2, 686).

Formation. — 1. By saponifying its dicetyl derivative with baryta-water (Reboul, A. Ch. 6, 14, 491). — 2. By warming trimethylene bromides with moist Ag₂O (Belestein a. Wiegang, B. 16,
METHYLENE METHYL ETHYL DIKETONE.

1497.—3. By allowing CH₄(CH₂Br)₂ to stand for some time with a large excess of water (Niederstein, M. 8, 389).—4. By boiling bromoform bromide with dilute aqueous KO₂ (Z.).

Properties.—Viscid, liquid, with a sweet taste, miscible with water.

Reactions.—1. Fuming HClO₄ at 100° converts it into CH₃(CH₂Cl)₂.—2. Trimethylene glycol (35 g.) heated with aldehyde (12 g.) at 100° yields the ethylidene derivative (v. infra).

**Di-acetylid ether CH₃(CH₂OAc)₂** (10°C. cor.). (c. 111°C.). S.G. 2-901; 1-070. S. 11. Formed by boiling CH₃(CH₂Br)₂ with NaOAc (Rebhun).

**Ethylidene derivative CH₃O₂ i.e. CH₂=CH|O.** V.D. 3-62 (calc. 3-53). Obtained by boiling the glycol with aldehyde at 100°, the yield being nearly the theoretical (Gow, J. 16, 409). Colourless liquid, with slight acetaldehyde odor. Dissolves in 1:1 volumes of water, v. sol. alcohol and ether. Separated from its aqueous solution by CaCl₂ and KOH. Saponified by boiling water, alcohols, and dilute acids. With PCl₃ it yields aldehyde and CH₃(CH₂Cl)₂.

**Amylaldehyde derivative C₃H₇O₂ i.e. CH₃|O.** (c. 165°C.). S.G. 2-995. V.D. 5-03 (calc. 4-96). Formed by heating trimethylene glycol (35 g.) with valeric aldehyde (20 g.) in a sealed tube at 125°. Colourless mobile liquid, v. sol. alcohol and water. Saponified by boiling water.

**Hexitol derivative C₃H₇O₂ i.e. CH₃|O.** (c. 210°C.). S.G. 2-933. From the glycol (30 g.) and heptioaldehyde (enanthon) at 160° (L.).


**TRIMETHYLENE-IMINE C₃H₂N i.e. CH₂|N.** (63°F-89°F). Formed, together with a polymericide C₅H₄N₂ (100°C.-167°C.), from CH₃Br, CH₃, C₂H₅, and NaOH in the cold (Gabriel a. Weiser, B. 21, 2699). Volatile liquid, smelling like NH₃ and fuming in the air. Eagerly combines with CS₂, B'H₃Cl, B'H₃PICO₃, B'C₃H₂Cl₄, and B'C₃H₂O₂H. (167°C.).


Formation.—1. By heating a iodofrom (4 mols.) with NaOEt (9 mols.) dissolved in alcohol (Butlerow, A. 29, 111, 242; cf. Brüning, A. 104, 187).—2. By heating chloroform with HIA at 130°C. (Bjelnduch, Z. 2, 7, 91).—3. By heating iodofrom (50 g.) with conc. HIAO (200 g.) to boiling (127°C.) and adding phosphorus (lieben, Z. 1588, 712; Baeyer, B. 5, 1095).—4. From methylene chloride and CaI₂ at 78°C. (Spindler, A. 289, 269).—5. By warming a mixture of iodofrom (5 pts.), water (2 pts.), and reduced iron (6 pts.), and fractionally distilling in vacuo (Cazenave, C. R. 98, 369).—6. An alcoholic solution of iodofrom is decomposed by light, yielding CH₂I₃ and iodine. Oxalic acid accelerates the reaction (Mulder, R. T. C. T. 7, 816).

Properties.—Yellowish liquid, boiling with partial decomposition at 160°C.


**Trimethylene iodide v. DI-IODO-PROPANE.**

**DI-TETRAMETHYLENE KETONE.**

**METHYLENE-ETHANIC ETHER C₃H₂O₂ i.e. CH₃(CO)₂Et.** (150°C.). Formed by heating malonic ether with methylene iodide and NaOEt (Zelinsky, B. 22, 3294). Mobile liquid. Isomeric with furmaric and maleic ethers. With bromine it yields CH₂Br₂CBr₂CO₂Et. (165°C). at 75-80 mm.)


A base, boiling at about 202°C, formed by the action of methylamine upon trioxymethylene (formic paraldehyde) is perhaps identical with the preceding (Kolhoff, B. 21, 1431).

**TRIMETHYLENE-HEXAHYDRO-METHYL-DIAMINE (C₃H₇N)₂(C₃H₇)₂.** Formed by heating trimethylene bromide (C₃H₂Br₂) with trimethyleneamine.

Salts.—B₂H₆Br₂aq.: soluble colourless needles. —B₂H₆Cl₄PICO₃: sparingly soluble (Roth, B. 14, 1351).


**METHYLENE DIMETHYL ETHER v. DI-methyl ether of Ortho-Formic Aldehyde.**

**METHYLENE ETHYL ETHYL DIKETONE C₃H₂O₂ i.e. C₃H₂O₂.CHO.CO.CH₃.** Acetyl-propionyl-methane. (150°C.). S.G. 1-9638. Formed by the action of Et₂O and NaOAc upon methyl ethyl ketone (Claissen a. Ehhrhardt, B. 22, 1014). —Cu(CH₂O₂)₂ (179°C.). Blende blue needles (from hot alcohol).
METHYLENE METHYL HEXYL DIKETONE.

**METHYLENE METHYL HEXYL DIKETONE** C₆H₅O₂CH₃ i.e. CH₃-CO.CH₃-CO.CH₃, (229°). Formed from methyl ketone, AcoEt, and AcoOna (Claisen a. Ehrhardt, B. 22, 1015). Liquid.—Cu(C₆H₅O₂H), (123°). Crystalline.

**DIACETYL METHYL DIKETONE** C₃H₅CO₂CH₃ i.e. CH₃-CO.CH₃-CO.CH₃, (225°). Di-acetyl-methane. Aci-H.) (Claisen a. Ehrhardt, B. 22, 1015). (Combes, C. r. 194, 1930). Preparation.—1. By slowly adding acetone (1 mol.) to a mixture of acetic ether (8½ mols) and dry NaOEt (1 mol.) heated on the water-bath. The product is poured into ice-cold water, and the aqueous liquid mixed with HOAc and cupric acetate, which ppt.s. Cu(C₆H₅O₂H). The yield is 35 p.c. of the weight of acetone employed (Claisen, B. 3, 1, 436).—2. Acetone (8½ pts.) mixed with EtOAc (33 pts.) is treated in the cold with sodium-wire (2:3 pts.). When most of the sodium is dissolved, the mixture is heated on a water-bath. The product is ppd. as cupric salt, the yield of ketone being 55 p.c. of the acetone employed (Claisen a. Ehrhardt, B. 22, 1017) (Combes, C. r. 194, 1930). Preparation.—3. By heating the metal with acetic acid and cupric acetate (obtained from the copper compound by adding dilute H₂SO₄ and extracting with ether).—From the compound C₃H₅O₂AlCl₃ (obtained from acetic chloride and AlCl₃) by adding water and extracting with chloroform. The yield is 85 p.c. of the theoretical (Combes, A. Ch. 9, 12, 211).—Properties.—Colourless liquid with pleasant aromatic odour, sol. water, v. sol. aqueous HCl, miscible with alcohol, ether, and chloroform. Not attacked by PCl₅.

Reactions.—1. **Phenyl-hydrazine forms phenyl-dimethyl-pyrazoles** C₆H₅CONH₂C₆H₅ (37°-5°). (Combes, B. 2, 50, 145).—2. **Potash decomposes it into acetone and KOAc**.—PCl₅ yields HCl and C₆H₅Cl (145°), a dia-choro-amylene which readily combines with bromine. —4. **Sodium-aluminium yields isopropyl alcohol and pinacole.** But in acid solution the products of reduction by sodium-aluminium are di-oxy-pentane CH₃CH₂(OH)CH₃CH₃CH₃ and a tetrachloro-compound with a hydrogen atom analogous to n-hexane. —5. Conc. HI at 185° reduces it to pure n-pentane (38°). At lower temperatures it forms CH₃CH₂(OH)CH₃ and CH₃CH₂CH₃CH₂CH₃. —6. Excess of chlorin in sunlight yields (CCl₄)₂CO₂CH₃ as final product. —7. **Bromine attacks the diketone vigorously, finally producing (C₆H₅Br)₂CH₃.** (187°).—8. **Oxidation by CrO₃, or by cupric acetate yields acetic acid.**—9. Warm dilute nitric acid produces CH₃NO₂ and HOAc.—10. **Dry ammonia** passed into its ethereal solution ppt.s. white pearly scales of the ammonium salt CH₃NH₃(CO₂H)₂, (111°) which yields a sticky cupric salt C₆H₅O₂Cu (137°) and a hydrochloride C₆H₅O₂H₅O₂Cl₃ melting above 280°. Other dimines act in like manner (Combes, C. R. 108, 1352).—12. Unites with benzidole (1 mol.) forming a base melting at 196° (Combes).—13. **Aldehyde-ammonia** (1 mol.) at 100° forms di-acetyl-tri-methyl-pyridine di-potassium (139°) which yields a solid cupric salt C₆H₅O₂Cu (197°).—14. **Toluenyl-dimine at 100°** followed by H₂SO₄ yields amidotrimethyl-quinoline C₆H₅N₂ (191°) (Combes, C. R. 108, 1924).—15. SOCl₂ forms the chloro-derivative CH₃SO₂Cl (185°) (Combes, C. R. 111, 272).

**Salts.**—CH₃(NH₂)₂(CO₂H). Pearly scales, ppd. by passing NH₃ into the ethereal solution. Decomposes readily into acetone and aceticamide.

—AcCNa. Formed by dissolving sodium in the diketone (Combes, C. R. 194, 1930). White six-sided prisms, insol. ether. Decomposed by water into acetone and NaOAc. With ethyl iodide at 140° it gives CH₃CO₂CH₃, a liquid boiling at 171°. Amyl iodide, in like manner, yields C₆H₅.CH₃.CO₂CH₃. The second atom of hydrogen in the molecule could be displaced by Na, and by acting with an alkyl iodide H₁ upon BOC₂(OH)₂, we may obtain compounds of the form ROC₂(OH)₂. These reactions take place with hardly any secondary decompositions. These homologues of methylene dimethyl diketone are decomposed by potash like the diketone itself (Combes, A. Ch. 9, 211). CICO₂Et acting on the sodium derivative of methylene dimethyl diketone forms C(OMe)₂(CO₂Et) (Claisen a. Zedel, B. 21, 3937).—KCHO₃. White six-sided prisms, sol. alcohol insol. ether. It is obtained by adding KOEt to an alcoholic solution of the diketone. Decomposed by hot water into acetone and KOAc.—Mg₂(H₂C₁₈)₃ (dried at 125°). From the diketone and magnesium carbonate (Combes, C. R. 105, 568). Transparent six-sided prisms. —Al₂(H₂C₁₈)₃. A by-product in the rectification of the diketone, from which it is separated by treatment with AlCl₃. Small red crystals, insol. water, sol. alcohol, v. sol. ether. Can be partially volatilised. Acts on polarised light. Not decomposed by alcoholic NH₃.—Cu(HOAc)₃ (dried at 125°). Pale-blue needles, obtained by adding cupric acetate or chloride to an aqueous solution of the diketone. Insol. water, the ppn. being complete in dilute solutions. At 65° it forms with CO₂O₃ dissolved in benzene a crystalline compound melting at 121° (Thomas a. Lefèvre, B. 2, 50, 193).—Fe₄(H₂C₁₈)₃. Red crystals, deposited from the ether soluble extract of the red solution obtained by adding FeCl₃ to the diketone dissolved in water.—P₄(H₂C₁₈)₃. From the diketone and lead carbonate. Transparent crystals, sol. water.


**Anhydride** CH₃CO₂CH₃—C(OMe)₂—CMe₂. (142°). Large transparent crystals (from ether).

Phenyl-methyl-hydrazide CH₃CO.CH₃(CNOH).CH₃ (Kohlrausch, A. 255, 32).

Di-methylene di-methyl triketone (CH₃CO₂CH₃)₂CO. Di-acetyl-acetone. [49°]. Formed from its anhydride (v. infra). Plates. Sl. sol. water, sol. alkalis, warm alcohol, and ether. FeCl₃ gives a deep-red colour. Converted by NH₃ into oxy-di-methyl-pyrrole [235°].

**Anhydride** C(OMe)₂—CMe₂—CO₂CH₃. (132°). (404°). Formed by the action of H₂O₂ on dehydroacetic acid at a high temperature (Fest, B. 22, 1570). A. 257, 355). The yield is 70 p.c. of the theoretical. Plates, v. sol. water. Converted by baryta, followed by HCl into di-methylene di-methyl tri-ketone. The carbonyl
acids of this anhydride is dehydrated acid. The dicarboxylic acid COOH(COOEt)COOHMeO [80°]. S. 8 at 20° is formed by the action of COCl₂ on copper acetocarboxylic acid, and is converted by Pf₂ into CS(COOEt)COOHMeO [110°] (Conrad, B. 19, 22; 20, 162; 2111).

**Di-phenylhydrazine** (CH₃C₆H₄NHNH₂).CO. [142°].

Trimethylene methyl ketone v. Trimethylene Methyl Ketone.

**Methylene dimethyl ether** v. Methyl ether of Formic orthaldehyde.


**Methylene Methyl Phenyl Ketone** v. Benzoyl-Aceton.

**Methylene-Methylene Phthalimidine**

C₆H₄NO.i.e.C₆H₄>NMe. Formed by heating phthal-methyl-imidyl-acetic acid CO=H.CO,H

C₆H₄>NMe above 210°. Colourless CO crystals. Volatile with steam. Volatile with steam, ether, and ether, more sparingly sol. water. Volatile with steam (Gabriel, B. 18, 2451).

**Methylene Methyl Propyl Di-ketone** C₆H₄O₂ i.e. CH₃.CO.CH₃.CO.OH, [172°]. S.O. 18411. Formed by the action of EtOAc and NaOAc upon methyl propyl ketone (Clausen a. Ehnhart, B. 22, 1015). Formed also from butyric acid, acetone, and NaOEt. Colourless oil. Boiling point 83.4°C. Yields C₆H₅N⁺CH₃COO⁻ [55°] crystallising in yellow prisms. —Cu(C₆H₅O₂)₂. [161°]. Blue needles.

**TETRA-PYRROLE - TRIMETHYLENE - DI-KETONE**

C₆H₄N₂Me i.e. CH₃.CMe₃.N.CH₃.CH₃[77°]). Formed by heating acetoxy-acetone with alcoholic tri-methylene-diamine at 120° (Paul a. Schneider, B. 19, 8157). Crystalline.

**Methylene Methyl Disulphone**

CH₃SO₂CH₃. [141°]. Formed from methyl mercaptan and methylene chloride, and oxidation of the product (Baumann, B. 23, 1875). Plates. On treatment with bromine-water it gives CBr₃SOMe₂ [234°].

**Di-methylene di-tri-sulphone**

(CH₃SO₂CH₃)₂SO₂. [185°]. Formed by saturating a solution of formic aldehyde with H₂S, extracting with ether, evaporating, dissolving the residual oil in aqueous NaOH, adding Me₃, and oxidising with KMnO₄ (Baumann, B. 24, 1872). Prisms, v. al. sol. cold water, alcohol, and ether yields with bromine-water insoluble C₆H₄Br₂SO₃ [190°].

**Methylene Tritrosamine**

C₆H₃N₃O₂ i.e. (CH₃.NNO)₃ [106°]. Formed from the action of nitrogen acid upon hexamethylenamine (F. Meyer, B. 21, 2650). Yellow needles or prism (from alcohol) v. sol. alcohol, insol. petroleum-ether. Decomposed by water with production of formic aldehyde.

**Methylene DI-OXYL oxide** v. Octyl ether of Formic orthaldehyde.

**Methylene oxide** is Formic aldehyde (q.v.).

**Methylene DI-OXY compounds** v. Methylene derivatives of Di-oxy compounds.

**Methylene DI-PHENYL DIAMINE** v. DI-PHENYL-METHYLENE-DIAMINE.

**Methylene DI-PHENYLENE v. DI-PHENYLENE-METHANE.

**Methylene Diphenylene oxide** v. DI-PHENYLENE-METHANE.

**Methylene Diphenylene diketone** v. Phenyl trimethylene ketone.

**Trichloroethylene phenyl ketone** v. Anhydride of Phenyl oxybutyl ketone.

**Methylene Diphenylene oxime** v. DI-PHENYLENE-METHANE OXIDE.

**Methylene Hexaphenyl phosphonium iodide** v. Methylene-di-iodide of Tri-phenyl-phosphine.

**Trichloroethyleneortho-Phthalamic acid** C₆H₄N₂O₄ i.e. CH₃(CH₃N=cH₂COH)COOH [70°-12°]. Obtained by boiling trimethylene di-phthalimide with phos (Gabriel, B. 21, 2670). Crystalline. Decomposed by water. On boiling with aqueous HCl it is converted into phthalic acid and trimethylene-diamine.

**Methylene-phthalaldehyde** C₆H₄O₂ i.e. C₆H₄=O.[90°]. Anhydride of o-Oxy-vinyl.

**Methylene benzoic acid** [60°]. Formed by heating phenylal-acetic acid in vacuo (Gabriel, B. 17, 2531). Small glistening crystals. Soluble in hot water, easily in alcohol, ether, benzene, &c. Volatile with steam. It readily polymerises. Combines with Br (1 mol.)

**Dibromide** C₆H₄Br₂ [99°]. Thick glistening crystals. Formed by the combination of methylene-phthalide with bromine. On warming with aqueous KOH it yields acetophenone-o-carboxylic acid C₆H₄(C₆H₅COH)COOH. Boiled with water it gives methylene-phthalide-ozone C₆H₄O₂ (Gabriel, B. 17, 2524).

**Methylene-phthalaldehyde oxide** C₆H₄O₂ [146°]. Long needles. Formed by boiling the dibromide of methylene-phthalide with water. Formed also by the action of water on the product of the bromination of acetophenone-o-carboxylic acid (Gabriel, B. 17, 2524).

**Di-chloro-methylene-phthalide** C₆H₄Cl₂O₂ i.e. C₆H₄=COC[18°]. Formed by passing Cl₂-CO through a mixture of a chloro-phenyl-acetic acid (1 pt.) and H₂OAc (10 pts.). Formed also by warming di-chloro-acetophenone-carboxylic acid with conc. H₂SO₄ (Zincke a. Cooksey, A. 265, 388). Long slender needles, gradually becoming compact when left in the liquid. The needles are v. sol. hot alcohol, benzene, H₂OAc, and benzol, the compact crystals are soluble with difficulty. Alcohol potsah
METHYLENE-PHALALIDE.

Converts it into di-chloro-acetophenone-o-carboxylic acid. Forms a dichloride.

C₄H₄Cl₂CO₂CO₂, which crystallises in colourless prisms (94°). v. sol. alcohol and HOAc, and converted by alcoholic potash into phthalic acid.

Bromo-methylene-phthalide v. vol. i. p. 580.

Isomeride of methylene phthalide v. METHYLENE-PHALATHYL.

Polymeride of methylene phthalide C₄H₄NO₃ [216°]. Obtained by allowing a solution of acetonaphthone carboxylic acid (1 pt.) in H₂SO₄ (2 pts.) to stand in the cold, and then ppg. with water (Iosser, B. 17, 2620; Gabriel, B. 17, 2626; cf. ACETOPHENONE CARBOXYLIC ACID, Reaction 2). Plates. Insol. water and cold alkalai, sol. alcohol, v. sol. HOAc.

Oxime C₄H₄NO₃ [180°]. Obtained by heating the substance with alcoholic hydroxylamine hydrochloride at 180°. Crystalline granules (from dilute HOAc).

METHYLENE-DI-PHALALIMIDE

CH₂(N<==CO)CH₂ [226°]. Formed by heating potassium phthalide (2 mols.) with methylene iodide (1 mol.) at 175° (Neumann, B. 23, 12002). Light-brown crystals (from HOAc); insol. dilute alkali. Yields phthalic acid on heating with HCl.

TRIMETHYLENE-DI-PHALALIMIDE

C₄H₄N₂O₄, i.e. CH₂CH₂N₂=CH₂=CH₂(N=CH₂)O₂. Formed by the action of tri-methylene bromide on potassium phthalide (Gabriel, B. 21, 2699). White needles; m. sol. hot HOAc, sl. sol. ether, CS₂, chloroform, and cold alcohol, v. sl. sol. water and petroleum ether. Converted by heating with KOH (needed for trimethylene-di-phthalalamic acid C₄H₄(NHCOCH₂CO₂H). Decomposes with heating with HCl at 180° into phthalic acid and tri-methylene-diamine.

METHYLENE-PHALATHYL C₄H₄O₃, i.e.

CH₂<==CO<==CH₂? [219°]. Fine yellow needles.

Formed, together with o-tribenzoylbenzene, by heating phthalic anhydride with malonic anhydride and sodium acetate (Gabriel, B. 14, 295).

METHYLENE-DI-PIPERIDINE


METHYLENE-TETRA-PROPYL-DIAMINE


METHYLENE-DI-OXIDE v. Di-propyl ether of formic orthoaldehyd.

TRI-METHYLENE-SELENO-UREA v. Selenium COMPOUNDS, ORGANIC.

METHYLENE SULFIDE v. Thiouformic ALDEHYDE.

Tri-methylene tetrasulphide O₃S₄, i.e. CH₄<==O₃S₄. [94°]. Formed by the action of H₂S on formic aldehyde (Baumann, B. 29, 1869). Colourless needle, insol. water, m. sol. alcohol and ether, v. e. sol. CHCl₃ and benzene.

METHYLENE SULPHOCYANIDE CH₄(SCN)₂, i.e. CH₄(SCN)₂ [102°]. Formed by digesting potassium sulphocyanide (2 mols.) with methylene iodide (1 mol.) in alcoholic solution for 3 or 4 hours on the water-bath, ppg. with water, and recrystallising from alcohol (Lermonetz, B. 7, 1292). Crystals; v. sol. alcohol and ether, m. sol. hot, nearly insol. cold, water. Oxidised by conc. HNO₃ to methane disulphonic acid.

TRI-METHYLENE-TRISULPHON

CH₃S₂O₃, i.e. CH₃<==O₃S₂<==O₃S₂<==O₃S₂. Formed by oxidising the formic paraloxyde (trithio-formic aldehyde) with KMnO₄ (E. Baumann a. R. Camps, B. 23, 69). Crystalline powder; insol. water, dilute acids, alcohol, ether, chloroform, and glacial acetic acid; v. sol. cold caustic soda, ammonia (by warming), and sodic carbonate. Expels CO₂ from Na₂CO₃, on warming. Conc. HNO₃ and H₂SO₄ have no action even on warming. Its solution in H₂SO₄ is ppy. by water unaltered. It partially sublimes. The six hydrogen atoms can be displaced by alkyl groups. The hexamethyl derivative

C₆H₅(SO₂-C₆H₅), SO₃CH₃ is identical with the product obtained by B. Jaaffé, R. Baumann, and Fromm (B. 22, 2598, 2009) by oxidising trithio-acetone.

TRIMETHYLENE-DI-SULPHONIC ACID so-called v. PROPANE-DI-SULPHONIC ACID.

METHYLENE TRI-THIO-CARBONATE

S<==O<==CS. Separates on gently heating CS(SNa)₂ with methylene iodide in alcoholic solution (Husmann a. A. 126, 292). Amorphous yellow-white powder; insol. water. Converted by fuming nitric acid into methane disulphonic acid.

TRIMETHYLENE-THIO-UREA CH₃(NH₂)<==O. Formed, together with ammonium sulphocyanide, by heating the sulphocyanide of trimethylene-diamine C₄H₄(NH₂)(NHCS₃) (Lellmann a. Würthner, A. 228, 232). White needles (from chloroform mixed with light petroleum). Sol. water, alcohol, CHCl₃ and benzene; m. sol. aqueous NaOH, insol. light petroleum. Forms a sparingly soluble compound with HCl.

Trimethylene-β-thio-urea

CH₃<==S<==CHE₄, NH. Formed by evaporating a solution of γ-bromo-propyl-amine hydrobromide and potassium sulphocyanide to dryness at 100° (Gabriel a. Lauer, B. 23, 94). Yields, v. sol. water forming an alkaline solution, from which it can be extracted by benzene.—B₁₂H₁₂. [136°]. B₁₂C₂(NH₂)₂OH. [128°]. Long needles.

TRIMETHYLENE-UREA CH₃NH₂O, i.e.

CH₃(NH₂)<==O. Oxy-pyrimidine terehydr. [209°]. Formed by heating trimethylene-diamine (1 mol.) with carbolic ether (1 mol.) for 6 hours at 180° (Fischer a. Koch, A. 292, 224).
White needles; v. sol. water, sl. sol. alcohol and ether. Its solution is neutral, and is not ppd. by HNO₃ or oxalic acid. By chromic acid, cyanate is oxidised to a compound C₅H₅N₃O₅ crystallising in plates [275°].

Tri-methylene-urea CH₂₄O₃CH₂CH₂ –O–CH₂NH
or CH₂₄O₃CH₂CH₂ –O–CH₃NH₂. Formed by evaporating a solution of equivalent quantities of potassium cyanate and d- or l-prolyl-amine hydrobromide (Gabriel a. Lauer, B. 23, 99). Thick liquid, v. sol. water.—B²[CH₄(NO₃)₂OH] [200°]. Long yellow needles.

Tri-methylene-di-urea CH₅N₂O₄ i.e. CH₃(CH₂)₂NH₂CO.NH₂ [227°]. Formed by warming a dilute aqueous solution of trimethylene-diamine hydrochloride with silver cyanate (F. a. K.). White needles; v. sol. water, sl. sol. alcohol, insol. ether.

**METHYLENE VIOLET C₄H₅N₃NO i.e. 
NMe₂

\[ \text{Oxy-imido-di-methyl-amido-} \]

Diphenylenesulphide. Oxy-dimethylamido-thiodiphenylimide. Formed by boiling a solution of methylene blue (base). Formed also by oxidising a mixture of di-methylene-di-phenyl, mercaptan, and phenol (Berthelot, A. 290, 171; 24, 90). Nodules; v. sol. water, sl. sol. alcohol, ether, acetone, chloroform, benzene, ligroin, and cumene, with a reddish-brown fluorescence; v. sol. aniline, without fluorescence.—B²HCl: v. sl. cold dilute HClaq.

**METHYLENITAN.** v. sol. ii. p. 571.

**DI-METHYL ENYNYLE DIKETONE C₅H₅N₃O i.e. CH₃(CH₆)₂CO.CH₂.** Di-acetyl-di-ethyl-n-pentane. (208° at 110 mm.) Formed from its dicarboxylic ether by treatment with alcoholic potash (Kipping a. Perkin, jun., C. J. 57, 39). Colourless oil, with slight aromatic odour, v. sol. water, miscible with alcohol and ether. It dissolves without change in conc. H₂SO₄, forming a yellowish-brown solution. It does not combine with NaHSO₄.

O₂HCH₃(CH₆)₂CO.CH₂.CO.NH₂ [111°]. Obtained by heating the ketone with an alcoholic solution of hydroxylamine, evaporating, adding water, and extracting with ether. Minute colourless crystals (from benzene-ligroin), v. sol. alcohol, ether, HOAc, benzene, and aqueous alkalis.

**DI-METHYL ENYNYLE DIKETONE DI-CARBOXYLIC ETHER CH₄(CH₆)₂CO.CH₂.CO.Et.** Di-acetyl-di-ethyl-pimelic ether. (130°). Obtained, together with compounds of low boiling-point, when sodium ethyl-acetoacetic ether is heated with an alcoholic solution of trimethylene bromide on a water-bath (Kipping a. Perkin, jun., C. J. 57, 31). Very slender needles (from ether-alcohol); v. sol. ether and alcohol, v. e. sol. benzene, light petroleum, xylene, and chloroform, insol. cold water. Gives no colour with FeCl₃. Readily decomposed by warm alcoholic potash.

**METHYL ENYNYLE KETONE CH₃.COH₃H₂.** [18°]. (224°). S.G. 1.23-2.93. The chief constituent of oil of rue, obtained by distilling Russ gravelosa with steam (Greville Williams, T. 1858 [1] 99; Hallwachs, A. 118, 109; Harbord, A. 128, 293; Giesecke, Z. [2] 6, 429; cf. Gerhardt, C. R. 26, 235, 361; Cahours, C. R. 26, 209). Occurs in the essential oil obtained from lime leaves (citrus Limoeta) (F. Watts, C. J. 49, 316). Formed also by distilling a mixture of calcium acetate and calcium decoate (Gorup-Besanez a. Grimm, A. 157, 275; B. 3, 516); and by boiling acetyl-acetocetic ether with alcoholic potash (Guthzeit, A. 294, 4). It is oxidised by chromic acid mixture to acetic and enolic acids. Sodium amalgam reduces it, in alcoholic solution, to sec-henecyl alcohol (229°). S.G. is 1.286. It combines with NH₃. With alkaline bisulphites it forms compounds such as C₂H₅.CMe(OH)₂SO₃N₂H. eq. which crystallises in pearly plates. FCl₃ converts the ketone into C₂H₅.Cl₂, which is resolved by distillation into HCl and C₂H₅.Cl (227°).

O₂HCH₂.CMe.NOH. [42°]. Minute prisms (from alcohol), v. sol. ether (Spiegler, M. 5, 424; B. 17, 176).

**METHYL ENYNYLE KETONE CARBOXYLIC ACID CH₃.COH₃H₂.CH₂.CH₂.CH₂.CH₂.CO.H.** Acetyl-di-ethyl-caprico acid. (254° at 90 min.). Formed, together with di-methyl enynylle diketone and acetic acid, by boiling di-ethyl enynylle diketone dicarboxylic acid with alcoholic potash (Kipping a. Perkin, C. J. 57, 36). Thick oil, miscible with alcohol, ether, and benzene.—Ag₂. Amorphous yps. m. sol. hot water.

O₂HCH₂.C(NO₃)₃.CH₂.CO.H. [103°]. Minute plates (from benzene-ligroin), v. sol. alcohol and benzene, sl. sol. ligroin, sol. alkalizes and conc. HClaq.

**TETRAMETHYLENYL-CARBINYL-AMINE C₅H₅N i.e. CH₂[CH₂CH₂CH₂CH₂CH₂]N₂[CH₂CH₂]₂.** Tetramethylenylamine. (83°). Formed from the nitrile of tetramethylene carboxylic acid CH₂[CH₂CH₂CH₂CH₂CH₂]CN by reduction in alcohol solution with sodium (Freund a. Gudeman, B. 21, 2692). Oil, with alkaline reaction, which absorbs CO₂ from the air.—B²HCl. [23°]. Crystallises from alcohol-ether, v. sol. water and alcohol, insol. ether.—B²H₂PCl₃. Crystalline.

**TETRAMETHYLENYL-CARBINYL - THIO-UREA C₅H₅N₂S i.e. CH₂[CH₂CH₂CH₂CH₂CH₂]NH.CS.N₂[CH₂CH₂]₂.** [68°]. Prepared by the action of ammonium sulphocyanide upon the hydrochloride of tetramethylenyl-carbinyl-ammine (Freund, B. 21, 2697). Slender needles (from water or alcohol).

**TETRAMETHYLENYL-CARBINYL-UREA C₅H₅N₂O i.e. CH₂[CH₂CH₂CH₂CH₂CH₂]OH.CH₂.CH₂.CH₂.NH.CO.NH₂ [116°].** Obtained by evaporating a solution of tetramethylenyl-carbinylamine hydrochloridewith potassium cyanate (Freund, B. 21, 2697). Needles, sol. alcohol, v. sol. hot, m. sol. cold water.

**DI-TETRAMETHYLENYL KETONE C₅H₅O i.e. CH₂[CH₂CH₂CH₂CH₂CH₂]O.** (205°). A product of the distillation of calcium tetramethylen carbonate with lime (Colman a. Perkin, jun., C. J. 51, 295). Oil, smelling of
peppermint; combines with NaHSO₄. Bromine reacts, giving off HBr.

\[ O_{3}CH_{3} \quad \text{or} \quad CH_{3}COOCH_{3} \]

\[ CH_{2}CH \quad CH \quad O \quad CH \]

Acetyl - trimethylenylene.

Methylene furano trimethylenyl diketone. (114°). S.G. 1.049. Obtained by distilling its carbonylic acid (Perkin, jun., C. J. 47, 886; 17, 1907). The same substance appears to be formed by treating methyl bromo-propyl ketone with solid potash (Lipp, B. 22, 1907). Oil, sl. sol. aqueous NaHSO₄. Gives an oily phenyl-hydrazide. Does not combine with water when kept in contact with it in the cold. According to Lipp the formula may be written

\[ CH_{2}CO \quad CH \quad CH \]

since it yields methyl oxo-propyl ketone (acetophenone alcohol) on heating with dil. HCl and Ag₂O at 105°.

Tetramethylenyl methyl ketone C₂H₅O.i.e.

\[ CH_{3}CH \quad CH \quad CH \quad CO \quad CH \]

or

\[ CH_{3}CH \quad CH \quad CH \quad CO \quad CH \]


TRIETHYLMETHYL KETONE CARBOXYLIC ACID C₃H₇O₂ i.e.

\[ CH \quad CH \quad CO \quad CO \quad CH \]

or

\[ CH \quad CH \quad CO \quad CO \quad CH \]

Methylene-furano tetrahydroxy carbonylic acid. Obtained by saponifying its ether which is formed by the action of H₂SO₄ on acetoxybutyl ether (Perkin, jun., B. 16, 8186; 17, 8561; C. J. 51, 823; Lipp, B. 22, 1210). Thick oil, converted by boiling with water into CO₂ and acetyl-propyl alcohol CH₃CO.CH₂.CO.CH₂.CO.CH₂.CO.H (145° at 100 mm.), -AgA'. Easily soluble crystalline monohydrate.


METHYL ETHENE V. PROPANE.

Di-methyl-ethene v. Butane.

Tri-methyl-ethene v. Pentane.

Tetra-methyl-ethene v. Hexane.

Penta-methyl-ethene v. Heptane.

Hexa-methyl-ethene v. Octane.

METHYL ETHANOL + TRICARBXYLIC ACID V. PROPANE TRICARBXYLIC ACID.

Di - methyl - ethanoyl tricarbxylic acid v. Butane TRICARBXYLIC ACID.

METHYL ETHANOL ETHYL DIKETONE C₃H₈O₂ i.e. CH₂CO.CH.CO.CH₂.CO.H (187° - 189°). Formed by the action of NaOH on a mixture of acetoxy ether and di-ethyl ketone (Claisen a. Ehrhard, B. 22, 1016). Crystalline. Formed from the acid and an ammoniacal solution of cupric oxide.

METHYL ETHANOL TOLUENE-DIAMINE C₆H₅N₂ i.e. \[ CH \quad CH \quad NH \quad NH \quad CH \]


Methylkoxidides B'MeI. (212°). From B'MeI and NaOH. Needles, v. s. sol. boiling alcohol and water, v. s. sol. boiling chloroform, insol. ether.-B'MeI. Formerly used in a small quantity in the preparation of B'MeI as described above. Black crystals.

Methyl-hydroxide B'MeOH. (186°). Formed by heating the methylkoxidide with

**METHYL ETHER v. DI-METHYL OXIDE.**

**PENTA-METHYL-ETHYL.** A name sometimes employed to denote the alcohol C$_5$H$_5$.C$_2$H$_5$.OH v. Heyt. ALCOHOL.

**METHYL-ETHYL-ACETAL v. ALDEHYDE.**

**METHYL-ETHYL-ACETIC ACID v. VALERIC ACID.**

Di-methyl-ethyl-acetic acid v. HEOXIO ACID.

**METHYL-ETHYL-ACTOACETIC ETHER v. ACTOACETIC ACID.**

**METHYL-ETHYL-ACETOXYMORPHINE.**

**METHYL-ETHYL-ACETOMORPHINE.**

**METHYL-ETHYL-ACTOXIN v. Oxim of METHYL ETHER ETHERONE.**

**METHYL-ETHYL-ACETOXYMORPHINIC ACID v. DI-ETHYLALKANOL.**

**METHYL-ETHYL-ACETONEN.**

**METHYL-ETHYL-ACETYLENE v. PENTINE.**

**METHYL-ETHYL-ACROLEIN v. HEMINO ACID.**

**METHYL-ETHYL-ACYLIC ACID v. HEMINO ACID.**

**PENTA-METHYL-ETHYL ALCOHOL v. TERTIARY-METHYL-ETHYL ALCOHOL.**

**DI-METHYL-ETHYL-ALKANOL.**

**DI-METHYL-ETHYL-ALKYL ALCOHOL v. HEMINO ALCOHOL.**


**Methyl-chloride C$_2$H$_4$Cl i.e. Me$_2$N$\text{Cl}_2$.**

**Di-methyl-di-ethyl-ammonium chloride.** Obtained from the crystalline isodide Me$_3$N$\text{Cl}_2$. which is formed by heating dimethylaniline with Et$_2$ or diethylamine with Me$_3$N (Peterson, A. 91, 122; V. Meyer a. Lecco, A. 180, 177). — (Me$_2$N$\text{Cl}_2$PO$_4$). yellowish di metric prisms, m. sol. in water, sol. in alcohol. S. 1.0—25 at 15°. — (Me$_2$N$\text{Cl}_2$)H$_2$O; triclinic crystals (Topsøe, J. 1893, 920). — Me$_2$N$_2$.CH$_2$Cl. — Me$_2$N$_2$.CH$_2$Cl. triclinic crystals. — Me$_2$N$\text{Cl}_2$.H$_2$O; dimetric crystals. — Methyl-o-picrate [287°]. Needles (Lossen, A. 181, 374).

**Ethyl-hydroxide v. TRI-EthyLAMINE methylhydroxide, vol. ii. p. 476.**

**DI-METHYL-ETHYL-AMINE NMe$_2$. (419).** A product of the action of heat on trimethylamine ethylchlorides (Collie a. Schryver, C. J. 57, 770). Formed also by distilling NMe$_2$.Et$_2$OH.

**Methyl-tri-ethyl-ammonium compounds v. METHYL-hydroxide of 2TRI-EthyLAMINE.**

**DI-METHYL-DI-ethyl-ammonium compounds v. METHYL-chloride of METHYL-di-ethyl-AMINE.**

**Tri-methyl-di-ethyl-ammonium compounds v. Ethyl-chloride of Methyl-di-ethyl-AMINE.**

**METHYL-ETHYL-ISOAMYL-AMINE C$_5$H$_8$. (183).** Formed, together with ethylene, by the dry distillation of methyl-di-ethyl-isomethyl-ammonium hydroxide $\text{MeNMe}_{2}.(\text{CH}_3)$.OH, which is obtained by the action of moist Ag$_2$O on the product of the union of Me$_3$N with di-ethyl-isomethyl-amine (Hofmann, C. J. 4, 317). Fragrant liquid, v. a. sol. water. — B'H$_2$PO$_4$. orange-yellow needles, v. a. sol. water.


**METHYL-ETHYL-ANILINE C$_8$H$_7$.N$_2$. (201° uncorg.).**


**PROPERTIES.** Crystalline, forming extremely soluble salts. The hydrochloride melts at 114° (Claux a. Hirtzel, B. 19, 2785).

**Methylo-iodide B'Me$_3$. [135°]; identical with di-methyl-aniline-ethyl-iodide (Claux a. Hauertgen, B. 14, 629).** — Hjortdalh J. 1892, 510. Triclinic crystals, v. a. sol. water and alcohol. Decomposed by boiling with cone. KOH$_2$Aq. yielding dimethylaniline. — B'HCl: (114°); very hygroscopic crystals. — (B'Me$_3$)$_2$N$_2$: monoclinic crystals. — (B'Me$_3$)Fe$_2$Fe$_2$C$_5$.2aq (Fischer, A. 190, 197).

**Ethyl-iodide B'EtI: [102°]; identical with di-ethyl-aniline methyliodide; by treatment with KOH it gives methyl-ethyl-aniline.**

**Propylo-iodide C$_8$H$_7$.NMe$_2$.Et$_2$I.** Methyl-propyl-aniline-ethyl-iodide, ethyl-propyl-aniline-iodide. Thick syrup, s. sol. water. Formed by the combination of methyl-propyl-aniline, methyl iodide, and ethyl-iodide. With propyl iodide, ethyl-iodide, methyl iodide, or methyl-propyl-aniline with ethyl iodide. By boiling with aqueous KOH the propyl group is split off and methyl-ethyl-aniline regenerated (Claux a. Hirtzel, B. 19, 2785).

**REFERENCE.** — Bromo-Methyl-ethyl-aniline.

**METHYL-ETHYL-ABSORINE v. ABEKIN COMPOUNDS, ORGANIC.**


**Methyl-ethyl-benzene v. Ethyl-toluene.**

**Di-methyl-ethyl-benzene v. ETHYL-XYLENE.**


**D Methyl-ethyl-benzene hexary.**

**BRIDE C$_8$. i.e. CH$_3$.CH$_2$.C$_8$.OH.
METHYL-ETHYL-BENZENE HEXAHYDRIDE.

$e$-Methyl-ethyl-hexamethylene. (151). Formed by boiling $\text{CH}_3\text{CH}_2\text{Me}$ with fuming HIAq, distilling with water, extracting with ether, and heating the resulting oily $\text{CH}_3\text{CH}_2\text{Me}$ with excess of HIAq (S.G. 1.98) and amorphous phosphorus for 8 hours at 235° (Ripping a. Perkin, jun., C. J. 57, 20). Mobile oil with a colour of paraflnin, miscible with alcohol and ether.


Amide $\text{CH}_3\text{MeEtSO}_4\text{ClO}_2$. Oily. Amide $\text{CH}_3\text{MeEtSO}_4\text{NH}_2$. Yellowish-brown oil, v. sl. cold water, sol. hot water.

Methyl-ethyl-benzene-sulphonic acid $\text{C}_6\text{H}_5\text{MeEtSO}_4\text{H}$. Formed by sulphonating ethyl-o-xylene (O. Jacobsen, B. 19, 2516; Stahl, B. 28, 991). Large plates. — B$a$A$'$aq: white plates, m. sol. hot or cold water (S.). — Na$'$A$'$aq: Small white plates, v. sol. water.

Amide $\text{CH}_3\text{MeEtSO}_4\text{NH}_2$ (129°). Long slender needles (from warm, very dilute alcohol), or large prisms (from alcohol).

Di-methyl-ethyl-benzene sulphonic acid $\text{C}_6\text{H}_5\text{MeEtSO}_4\text{H}$. Laurene sulphuric acid. Formed by sulphonating laurene. According to Reuter it is accompanied by an amorphous isomer. — $\text{NaA}''$aq: plates. Triclinic crystals (Reuter, B. 10, 627). When steam is passed into its solution in dilute $\text{H}_2\text{SO}_4$, hydrolysis begins when, through concentration, the temperature has reached 130° (Armstrong a. Miller, C. J. 45, 148). — B$a$A$'$aq: $\text{B}''$aq. Small needles (from B$''$aq) 126°.

Amide $\text{CH}_3\text{MeEtSO}_4\text{NH}_2$ (127°). (B.). (1, 4, 5-Di-methyl-ethyl-benzene sulphonic acid $\text{C}_6\text{H}_5\text{MeEtSO}_4\text{H}$. Formed by sulphonating ethyl-m-xylene (J.). — B$a$A$'$aq: trimetrical laminae. — NaA$'$aq: prisms.

Amide $\text{CH}_3\text{MeEtSO}_4\text{NH}_2$ (148°). (1, 4, 5-Di-methyl-ethylbenzene sulphonic acid $\text{C}_6\text{H}_5\text{MeEtSO}_4\text{H}$. Formed by sulphonating ethyl-p-xylene (Jacobson, B. 19, 2516). Large plates (from dilute $\text{H}_2\text{SO}_4$).—NaA$'$aq: mass of large plates (from warm saturated solution). — Ka$'$aq: flat needles, v. sol. water. — B$a$A$'$aq: long six-sided plates, m. sol. cold, m. sol. hot, water. — CaA$'$aq: light-blue needles (Stahl, B. 23, 690). Amide $\text{CH}_3\text{MeEtSO}_4\text{NH}_2$ (117°). Pearly plates (from dilute alcohol), or large transparent crystal (from warm alcohol); v. sol. hot alcohol.

METHYL DI-ETHYL BORATE $\text{MeEtBO}_3$ (100°—106°). S.G. 2—904. Formed by heating $\text{MeBO}_3$ with absolute alcohol at 100°.

METHYL DI-ETHYL ETHER. Decomposed on distillation with KOH yielding troplene $\text{C}_8\text{H}_{40}$, an oil $\text{C}_8\text{H}_{12}$ (205°—207°), dimethylamine and methyl-troplene. With moist Ag$'$O it
Gives a syrupy base which yields the salts: 

(B'MeCl)2P(=O)-O-B'MeBr. B'MeCl2(NH3)2O.

Methyl - Ethyl - Ethylene - Di - Phenol C6H5CH2OH i.e.

CH:CH N:CH 


DI-METHYL ETHYLENE DISULPHIDE CH3S = CH2 i.e. Me2S(NMe).

Di-methyl ether of di-thio- glycol. [189°]. Formed from ethylene (Ewerlöf, B. 4, 716).

DI-METHYL ETHYLENE DISULPHONE CH3S > CH2S i.e. Me2S(NMe).

Di-methyl ether of ethylene disulphonic acid. Methylation of ethylene thiourea.

CH2S > CH2S i.e. NMe CH2 S = CH2

Oxazimethypropylamine. The methyl - iodide of B'MeO of this body is formed by the action of MeI on para-ethyl glyoxaline (Ritzsiewsky, B. 16, 490).

References. — Di-ethoxy-, and chloro-

METHYL-ETHYL-ETHYLENE DIKETONE. METHYL-ETHYL-GLYCOM X. OXIM OF.

METHYL-ETHYL-HYDROXYLAMINE.

HYDROXYLAMINE DERIVATIVES.

METHYL-ETHYLIDENE ETHYL DIKETONE CH3H2O i.e. CH3CO.CHMe.CO.CH2.


METHYL-ETHYLIDENE DIETHYL SULPHONE. DI-ETHYL PROPYLIDENE DI-SULPHONE.

DI-METHYL-ETHYLIDENE DI-INDOLE C6H5N i.e. CH3CH2(NMe)2.


DI-METHYL ETHYLIDENE DIKETONE.

METHYL-ETHYLIDENE ETHYL-GLYXALINE C6H5N. i.e. CMe2N.CH2

213°. S.G. 1.189. Formed by the action of ethyl bromide on methylglyoxaline (glyoxal-ethyline) (Ritzsiewsky, B. 16, 499). Formed also from di-ethyl-oxime N=C=O.CO.CO.NH2 by treatment with POCl and heating the hydro-oxime (10 g.) of the resulting 'chloroaldehyde' C6H5ClIN with H2Aq (7 g. of S.G. 1.9) and ammonous phosphorus (1 g.) for 6 hours at 140°. The product is dissolved in water, rendered alkaline, and extracted with chloroform (Walsch, A. 214, 206). Colourless liquid, with narcotic smell. Sol. water and alcohol. AgNO3 gives a crystalline pp., HgCl, a white pp. The zinc double chloride forms crystals melting at (105°). Burns with a blue flame. It is a strong base and optically active oxides from their salts. Its zinc double salt distilled with lime yields pyrrole, ammonia, HC, ethylene, and methyl-glyxaline (para-oxal-methylene) (Wallach, A. 214, 206). It acts physiologically like atropine (Sohls, B. 13, 3157). When heated in a sealed tube with dilute H2SO4 at 240° it yields ethylamine. KMnO4 yields oxalic acid, H2, and acetic acid. When passed through a red-hot tube it yields HC, and methyl-glyxaline (para-oxal-methylene). H2O oxidises it to ethyl-oxamidine (Ritzsiewsky, B. 17, 1300).

Salt.—B'HCl: deliquescent crystals. 


Benzyl-chloride C6H5.NH.CH2.CH2.Cl. Methylique - thiol - ethylene C6H5N2 i.e. NMe.CH

Methyl - iodide of this body is formed by the action of MeI on para-ethyl glyoxaline (Ritzsiewsky, B. 16, 490).

References. — Di-ethoxy-, and chloro-
also by reducing the nitrosamine of ethyl-amido-acetophenone, dissolved in dilute acetic acid, with zinc-dust, adding NaOH, and distilling with steam. The oily distillate is dissolved in dilute H₂SO₄, mixed with NaNO₃, and extracted with ether (Fischer a. Tafel, A. 227, 303). Plates, sl. sol. water, v. e. sol. alcohol and ether. Volatile with steam, giving off a pungent odour. Not affected by nitric acid or by Ac₂O. Does not reduce Fehling's solution. Forms crystalline plates with AgNO₃ and HgCl₂, which may be recrystallised from hot water in slender needles. Its salts are extremely soluble in water. — B′H₂SO₄; long needles. — B′′H₂PtCl₆: sparingly soluble orange prisms. — Picroate: yellow needles.

Methylo-iodide B'Ml. [192].

METHYL-ETHYL-ISO-INDAZINE CARBONYLIC ACID C₃H₃N₂O i.e. C₃H₃N₂O + CH₃CO₂H (292° i.v.).

Formed by treating the nitrosamine of ethyl-amido-cinnamic acid with zinc-dust and acetic acid (Fischer a. Kurel, A. 221, 246). Colourless plates with sol. water, v. sol. alcohol, ether, and chloroform. Combines with alkalis and with acids. Does not reduce boiling alkaline solutions of silver or copper. With bromine in HOAc it forms a bromo-derivative [173°] and a di-bromo-derivative.

METHYL-ETHYL-INDOLE C₃H₃N i.e. C₃H₃N + CH₃CO₂H (292° i.v.).

Formed by heating the phenyl-hydrazide of methyl propyly ketone with ZnCl₂ at 180° (E. Fischer, B. 19, 1565; A. 236, 152). Yellowish oil, v. sol. water, v. sol. alcohol and ether. Its picroate crystallises from hot benzene in dark-red needles. With NaNO₃ and HOAc it yields a nitrosamine.

Methyl - ethyl - indole C₃H₃N + CH₃CO₂H + MeC₄H₉O (106° i.v.).


Methyl-ethyl-indole C₃H₃N + CH₃CO₂H + MeC₄H₉O (106° i.v.).


Di-methyl-ethyl-indole C₄H₄N₂ i.e. C₄H₄N₂ + CH₃CO₂H (291° i.v.).

Formed by heating its bromo-leucinamide (bromo-acetyl-propionate) acid with ethyl-aniline (Wölf, B. 21, 5868). Yellowish oil, v. sol. ether, alcohol, and benzene. sl. sol. water. — Picroate B′′C₅H₄(NO₃)OH. [106°].

Red needles, m. sol. benzene.

METHYL-ETHYL-INDOLE CARBOXYLIC ACID C₆H₅NO₂ i.e. C₆H₅NO₂ + CH₃CO₂H (292° i.v.).

Formed from the p-tolyl-ethyl-hydrazide of pyruvic acid by warming with dilute (10 p c.)
B. 21, 2177). Formed also from ethyl ace to acetic acid by saponifying with dilute (3 p.p.) alkali, treating the product with NaNO₃ and H₂SO₄, removing alcohol by distillation, adding dilute H₂SO₄ (15 p.p.) and distilling with steam (von Pechmann, B. 21, 1411, 2140). Dark yellow liquid, smelling like quinone, v. sol. ordinary solvents. Forms an unstable compound with alcohol. Reacts with aniline, forming a compound crystallising in needles and melting at 137°. Aqueous NaOH converts it into a 'quinonogen,' and finally into a quinone [112°], which may be reduced to a hydroquinone [220°], and yields a phenylhydrazide [258°].


(b) Osim-(a)-phenylhydrazide CH₃.CO.C(OH).CH₃.H₂. [131°]. Formed from the (b)-oxim and phenylhydrazine (Otto a. Pechmann, B. 22, 2118). Crystallises from benzene and ligroin.

Phenylhydrazide CH₃.CO.C(NH)₂.CH₃. [117°]. Formed by saponifying ethyl ace to acetic acid by allowing it to stand with aqueous KOH, then adding di- azobenzene chloride, and ppg. by sodium acetate solution (Japp a. Klingemann, C. 53, 519; B. 21, 560; A. 217, 229). Yellow radiating needles or prisms (from benzene).

Di-phenylhydrazide CH₃.CO.C(NH)₂.CH₃. [162°] (J); [166°-169°] (C. a. M.). Formed by the action of phenylhydrazine on the di-oxim, on the (b)-phenylhydrazide, or on the (a)-oxim (von Pechmann, B. 21, 1414; Japp, A. 247, 221; Claisen a. Monasse B. 22, 639). Yellow needles (from benzene), sol. cold conc. H₂SO₄ forming a brown solution.

**METHYL-ETHYL-KETONE CARBOXYLIC ACID v. Methyl-aceto acetic Acid.


**Formation.**—1. By saponifying its ether which is obtained by treating ethyl-malonic ether with Mel and NaOEt, or methyl-malonic ether with EtI and NaOEt (Conrad a. Bischoff, B. 13, 596; A. 204, 146).—2. Together with a larger quantity of the isomeric s-di-methyl-sebacic acid [194°], by reducing the anhydride di-methyl-malonic acid (pyrocinchonic acid) with HI or sodium-amalgam (Otto a. Beckurts, B. 18, 841).


Salt. — AgA. Sparingly soluble white crystalline pp.


**METHYL-ETHYL-METHANE **v. **Butane.** Methyl-di-ethyl-methane. v. HÜXNEMANN.

**Tri-methyl-ethyl-methane v. Tri-tertiary**.

**METHYL-ETHYL-PENTAMETHYLYL METHYL KETONE TRHYDRIDE C₆H₅.O i.e. C₆H₅.O.CH₃.**

**Methyl-ethyl-pentamethylenyl**

**METHYL-ETHYL-PENTAMETHYLENE C₆H₅.O.CH₃.**

**Methyl-Ethyl-oxys** v. Oxy-Methyl-ethyl.

**METHYL-ETHYL-PHENOL C₆H₅.O i.e. CH₃.C₂H₅.OH.** (216°). Prepared by fusing p methyl-ethyl-benzene sulphonio acid with

**SALT.** — AgA. Sparingly soluble white crystalline pp.

potash, dissolving the product in water, acidifying, and extracting with ether (Maszara, G. 10, 255). Oil, sl. sol. water. Gives an azure-blue colouration with Fehling.

Di-methyl-ethyl-phenol C₆H₅MeEt(OH) [f.:d:12] 37°. (245°). Obtained by potash-fusion from the corresponding di-methyl-ethyl benzene sulphonate (Stahl, B. 23, 290). FeCl₃ gives an intense green colour in alcoholic (not in aqueous) solution.

**METHYL ETHYL PHENOL**

**METHYL ETHYL PHENYL AMINE** v. **AMMONIUM TARTRATE.**


SALT. — B'ÁléI: needles; easily sol. alcohol, v. sl. sol. hot water, insol. cold water. The acetate and sulphate form easily soluble needles. The oxalate forms very sparingly soluble quadruple prisms.

**Acetyl derivative C₆Me₄Et*NHAc: [182°]**; needles.


**DI METHYL ETHYL PHOSPHATE** C₆H₅PO i.e. Me₄EtPO (203° cor.). S.G. 2.1762. S.V. 1595. (Collie, C. J. 54, 274, 74). Formed from Me₄OPO and EtI (Weger, A. 221, 90).

**DI METHYL ETHYL PHOSPHONE C₆H₅P i.e. Et₄PMe (111°).** Formed by heating tri-ethyl-phosphine-methyl-chloride Et₃PMeCl at 500° (Collie, C. J. 53, 719). Combines with sulphur and with oxygen. Forms rod crystals with Cs₂O.

**Methylo-chloride v. Ethylo-chloride of Di-methyl-ethyl-phosphone.**

**Ethylo-iodide v. Triethyl-phosphone.**

**METHYL ETHYL PIPERIDINE** v. **METHYL ETHYL PYRIDINE HEXAHYDRIDE.**

**METHYL ETHYL PROPYLIC ALCOHOL** v. **HEXYL ALCOHOL.**


**METHYL ETHYL PROPYLIC CARBINOL** v. **TERT-HEXYL ALCOHOL.**

**METHYL ETHYL PROPYLIC METHANE** v. **HEPTANE.**

**DI M ETHYL DI ETHYL PYRAZINE** C₆H₅N₂ i.e. N₂C₆Me₂EtN > N. Di-ethyl ketine. (215° cor.). V.D. 5-63 (calc. 5-68). Prepared by reduction of the oxim of methyl ethyl diketone (methyl nitroso-propyl ketone) Me₂CO(NH)(Et) with tin and HCl, or with sodium amalgam (Treadwell, B. 14, 1451). Colourless oil with narcotic smell and alkaline reaction. It is a weak poison. Combines with water forming a crystalline hydrate. Not affected by Me₂CO anhydride, or HI. Bromine added to its solution in H₂Oat ppts. C₆H₅N₂Br₂ as an unstable yellow compound. Very dilute potassium permanganate oxidises it to diethyl pyrazinedi-carboxylic acid N₂C₆Me₂(CO₂H)₂ > N₂C₆Me₂CO₂H which does not yield an anhydride (Economides, B. 19, 2524). B'HCl: Large colourless crystals. B'H₂PO₄: Soluble rod prisms. B'AgNO₃: Crystals, almost insol. cold water, v. e. sol. dilute HNO₃ (Treadwell, B. 14, 2154).

Hydrate B'zaq. (43°). Large prisms (by sublimation). Given up its water in dry air, becoming liquid.

**METHYL ETHYL PYRIDINE** C₆H₅N i.e. N₂C₆Me₂CH > C₆Me₂CH(N) (179°). S.G. 2.929 (Richard, Bl. 2) 32, 488; 129-929 (Weidcl a. Pick, M. 5, 659). S.V. 159°-9 (Ramsay). A base found, together with many others, among the products of the dry distillation of bones (Anderson, P. M. [4] 9, 145, 214; A. 94, 360), of bituminous shale (Greville Williams, C. J. 7, 97) and of peat (Church a. Owen, P. M. [4] 30, 110). It occurs in coal tar. Colourless oil, with unpleasant odour. Fumes with HCl. V. sl. sol. water, separating again when warmed, v. sol. alcohol, ether, and oils. Ppts. ferro, aluminim, chromium, and mercuric oxides from their salts, but not manganese and nickel oxides. Its salts are deliquescent and gummy. KMnO₄ oxidises it to pyridine dicyanoboronic (lutidine) acid (219°), which is converted by heat into pyridine carboxylic acid [303°]. B'H₂PO₄: Orange-yellow flakes.


't'-Collidine C₆H₅N₃. (179°-188°). This base, according to Oechsler de Coninck (A. Ch. 627, 468), accompanies (β)-collidine in the
METHYL-ETHYL-PYRIDINE.

Product of the distillation of cinchonine with KOH. It is perhaps identical with (a)-collidine.

When (a)-collidine is heated with ethylene
chlorohydryde and a little water for a few hours at 100° combination takes place. After removing uncombined collidine and chlorohydryde by shaking with ether, the residue is evaporated in vacuo. PtCl₄ forms with the product an orange-yellow pp. of \( [\text{C}_6\text{H}_5\text{N}+\text{N(C,H,OH)}]_2\text{PtCl}_4 \). Boiling water removes HCl, forming oxetyl-a-collidine chloro-platininate \( [\text{CH}_3\text{H}_2\text{N}+\text{N(CH,OH)}]_2\text{PtCl}_4 \). This forms brilliant scales (from alcohol). Oxetyl-a-collidine forms a gold salt, B'AnCl₂, crystallising in thin golden needles (Wurts, Pr. 83, 460; C. R. 95, 620; Bl. [3] 80, 536).

Methyl-ethyl-pyridine \( \text{N}<\text{CH}_2\text{CH}<\text{CMe}<\text{CH}_2\text{CH}<\text{CNMe} \) (a)-Collidine. (1906). S. G. 5-946. V. D. 4-25 (ca.-4/25). Obtained by distilling collidine or brijine with KOH (Oechsenor et Co.). Colboc., C. R. 93, 266; A. Ch. (5) 27, 249; Bl. [2] 77, 457; 49, 100; R. T. C. 1, 132; cf. Greville Williams, Tr. E. 21, Part 2; A. Ch. [3] 45, 488. Colourless, highly refractive liquid, quickly turning yellow on exposure to air. St. sol. water, sol. alcohol and ether. When left in contact with moist air it takes up water (1 mol.) but does not form a well-defined hydrate. Potassium permanganate oxidizes it to homo-nicotinic acid

\[ \text{N}<\text{CH}<\text{CO}<\text{CH}<\text{CNMe} \] cinchoneric acid

\[ \text{N}<\text{CH}<\text{CO}<\text{CH}<\text{CNMe} \]

It is very poisonous, a subcutaneous injection of 1 g. paralyzing the nerve centres. H₂ reduces it to the hydride \( \text{C}_6\text{H}_5\text{N} \), and, at 250°, forms a brown oil \( \text{C}_6\text{H}_5\text{N}_2 \). Sodium in alcohol reduces it to the hexahydride \( \text{C}_6\text{H}_5\text{N}_2 \) (175°-180°).


- B'H₂AuCl₄. - B'H₂Cl₂AuCl₄. - B'H₃HgCl₄. Minute white needles, sl. sol. alcohol, insol. in sol. water.

Methyl-ethyl-pyridine \( \text{N}<\text{CH}_2\text{CH}<\text{CMe}<\text{CH}_2\text{CH}<\text{CNMe} \) Collidine. (1767). S. G. 5-9589 (D.).

Occurrence.-As acetate in fusel oil (Krämer a. Pinner, B. 87, 77).

Formation.-1. By heating ethylidene chloride with alcoholic or aqueous ammonia for 12 hours at 160° (Krämer, Z. 2, 6, 556; B. 5, 2024) Dürkopf, B. 18, 920). Ethylidene bromide may be used instead of the chloride, the temperature employed being then 125°-140° (Tavildaroff, A. 176, 13).-2. By heating an alcoholic solution of ethylaldehyde-ammonia at 120° (Baeyer a. Ador. A. 155, 297). "Para"-collidine, picoline, and lutidine are also formed in this reaction (Vohl, J. 1870, 807).-3. By distilling alcol-ammonia (aldehyde) (Wurts, Bl. [2] 31, 493).-4. By heating glycol with ammonium chloride for 8 hours at 185°; the yield being from 15 to 20 p.c. of the theoretical quantity (Hofmann, B. 17, 1905).-5. By heating ethylene chloride with ethylidene amine at 180° (Hofmann, B. 17, 1907).-6. By heating pylaldehyde with acetamide and N₂. (Pet.) at 160° (Hessekie, Bl. 15, 8091).-7. By heating aldehyde-ammonia with paraldehyde at 220° (Ladenburg a. Dürkopf, A. 247, 42).

Properties.-Oil, with aromatic odour, insol. water and dilute acids, v. sol. alcohol and ether. Fumes with HCl. Oxidized by KMnO₄ to methylpyridine carboxylic acid

\[ \text{N}<\text{CH}<\text{C(OH)}<\text{CH}<\text{CNMe} \]

and isocinchoneric acid

\[ \text{N}<\text{CH}<\text{C(OH)}<\text{CH}<\text{CNMe} \]

(Dürkopf a. Schlaug, B. 21, 294; cf. Wischnogordy, B. 12, 1606). Bromine forms an oily compound. Fuming HIaq and amorphous phosphorus at 140° yield brownish-blue prisms of C₆H₅N₄ or C₆H₅N₁. (Ladenburg, B. 14, 252).

Sodium, acting on its alcoholic solution, forms a hexahydrate. Heated for some days at 100° with glycolic chlorohydrine and a little water it forms oxetyl-aldehyde, of which the platino-chloride, \( \text{C}_6\text{H}_5\text{N}<\text{N(CH,OH)}<\text{CMe}<\text{CH}<\text{CNMe} \), forms orange crystals (from dilute alcohol). It may be decomposed by H₂S; the hydrochloride produced would not crystallize, but it is converted by AgNO₃ into a caustic base (Wurts, Pr. 33, 419).


Ethyl-aldehyde-

Beil. Triclinic tablets. v. sol. water and alcohol. Yields (B'C₆H₂Cl₄)PtCl₄ crystallising in needles or prisms.

Methyl-ethyl-pyridine \( \text{N}<\text{CH}<\text{CMe}<\text{CH}<\text{CNMe} \) (1615). S. G. 5-9361. Formed by heating (a)-methyl-pyridine (a-picoline) with EtHCl at 280°- 300° (Ladenburg a. Schultz, A. 247, 46; B. 20, 2730). Liquid, almost insol. water, but takes up water from the air. Very volatile with steam. Oxidised by KMnO₄ to pyridine dicarboxylic acid

\[ \text{N}<\text{C(OH)}<\text{CH}<\text{C(OH)}<\text{CH}<\text{CNMe} \]

Sodium reduces it, in alcoholic solution, to a hexahydrate.


Methyl-ethyl-pyridine \( \text{N}<\text{CH}<\text{CMe}<\text{CH}<\text{CNMe} \) (172°). S. G. 5-9253; 2° 9218. Formed by heating (a)-methyl-pyridine with EtHCl at 280°- 300°, and separated from the preceding by fractional distillation (Schultz, B. 20, 2730; Ladenburg, A. 247, 46). Colourless hygroscopic liquid, with unpleasant odour, sl. sol. water. Oxidised by KMnO₄ to pyridine dicarboxylic acid

\[ \text{N}<\text{C(OH)}<\text{CH}<\text{C(OH)}<\text{CH}<\text{CNMe} \]

Sodium, added to its alcoholic solution, reduces it to the corresponding hexahydrate.

Salts.-B'H₂P′Cl₄. [190°]. Reddish-yellow plates, sl. sol. cold, v. sol. hot, water, insol. alcohol. B'H₂AuCl₄. [90°]. Yellow needles, sl. sol. cold, m. sol. hot, v. o. sol. alcohol. The phosphomolybdate and bismuthiodide are amorphous, the cadmium iodide and periodioide are oily.


*α*
METHYL-ETHYL-PYRIDINE.

Isomeride of collidine.—Obtained by the putrefaction at 40° of pancreas (200 g.) mixed with gelatin (600 g.) and water (10,000 g.). After 5 days the liquid is distilled, first with H₂SO₄, and afterwards with baryta. The alkaline distillate is neutralised by HCl, evaporated to dryness, and extracted with alcohol. The hydrochloride of the base crystallises from alcohol in triclinic needles. The free base is got by adding NaOH to the hydrochloride and shaking with ether (Nenczi, J. pr. [2] 26, 49). —(B',H₂)(ICl₃). Flat needles. Gives off an odour of xylene when distilled. The base is not identical with collidine (from NH₃ and ethyldiene chloride), for it differs in odour, in the crystalline form of the platiniochloride, and in being more soluble in water.


Methyl-toidide B'MeI. Slender needles. Isomeride of collidine v. TRI-METHYL-PYRIDINE.


Di-methyl-ethyl-pyridine C₆H₅N i.e. N-CMe₂CH-C≡N. (187°). S.G. 2 916. S. 1 3 at 9°. Obtained by the action of propionic aldehyde and ammonia on acetoacetic ether (Jaskele, A. 246, 46). Formed also by heating of a redness a mixture of potassium di-methyl-ethyl-pyridine dicarboxylate (1 mol) with lime (2 moles) (Engelmann, A. 231, 44). Liquid, more soluble in cold than in hot water. Its solution has a very bitter taste. KMM₄ oxidises it to methyl-ethyl-pyridine carboxylic acid and uvitonic acid.


Methyl-ethyl-pyridine hexahydrate C₅H₅N (c. 177°). Formed by adding sodium to an alcoholic solution of (8)-collidine (Oecheiner de Coninck, Bl. 2 [3] 42, 116).

Methyl-ethyl-pyridine hexahydrate C₅H₅N i.e. NH₃<CHMe₂CH>C≡N. Copelidine. (184°). S.G. 2 8653; μ 8546. Formed from the collidine derived from aldehyde, by reduction in alcoholic solution with sodium (Dürkopf, B. 18, 920; Ladenburg, A. 247, 90). Colourless alkaline liquid, sl. sol. water. Its physiological action resembles that of colchicine, but is weaker.


Methyl-ethyl-pyridine hexahydrate NH₃<CHMe₂CH>C≡N. (147°–151°). S.G. 2 8550; μ 8410. Formed by reducing the corresponding methyl-ethyl-pyridine in alcoholic solution with sodium, the product being purified by means of its oily nitrosamine (Schultz, B. 20, 2723; Ladenburg, A. 247, 95). Colourless alkaline liquid, smelling strongly like ammonia and like pipedine, sl. sol. water.


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solved in MgOH, the product being distilled with strong aqueous NaOH (Ladenburg, A. 247, 71). Liquid, smelling like \( \text{C}_3\text{H}_8\text{N} \) pyridine hexahydrate; sl. sol. water. Its hydrochloride crystallises in small needles.

**Di-methyl-ethyl-pyridine hydrochloride**

\[ \text{C}_8\text{H}_8\text{N} \text{CHMe.C.H}_4 \text{C.H}_4 \text{C.H}_4 \text{Cl} \]  

**Parvolute**

*Purpurine.* (177). S.G. \( \frac{1}{2} \) 8628; \( \frac{1}{2} \) 8542; \( \frac{1}{2} \) 8474. Formed at the same time as di-methyl-ethyl-pyridine (198°), when propionic aldehyde-ammonium bromide and propionic aldehyde are heated together at 200°. Formed also by reducing the same di-methyl-ethyl-pyridine by adding sodium to its alcoholic solution (Dürkopf a. Götsch, B. 23, 690). Very mobile colourless liquid, with penetrating odour like rotten hay, v. sol. ether and alcohol, sl. sol. water. Strongly alkaline in reaction.

**B.\( \text{H}_4\text{C.H}_4\)Cl** (180°–130°). White sparingly soluble needles (from hot water). —The hydrochloride and hydroiodide are hygroscopic. Chlorides of gold and of platinum give no pp. in dilute solution, and oily pps. in concentrated solutions. Fierc acid acts in like manner.

**Di-methyl-ethyl-pyridine hexahydrate**

\[ \text{C}_8\text{H}_8\text{N} \text{CHMe.C.H}_4 \text{C.H}_4 \text{C.H}_4 \text{C.H}_4 \text{H}_2 \text{O}_6 \]  

**Parvolute**

*Purpurine.* (177). S.G. \( \frac{1}{2} \) 8628; \( \frac{1}{2} \) 8542; \( \frac{1}{2} \) 8474. Formed at the same time as di-methyl-ethyl-pyridine (198°), when propionic aldehyde-ammonium bromide and propionic aldehyde are heated together at 200°. Formed also by reducing the same di-methyl-ethyl-pyridine by adding sodium to its alcoholic solution (Dürkopf a. Götsch, B. 23, 690). Very mobile colourless liquid, with penetrating odour like rotten hay, v. sol. ether and alcohol, sl. sol. water. Strongly alkaline in reaction.

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**Di-methyl-ethyl-pyridine hexahydrate**

\[ \text{C}_8\text{H}_8\text{N} \text{CHMe.C.H}_4 \text{C.H}_4 \text{C.H}_4 \text{C.H}_4 \text{H}_2 \text{O}_6 \]  

**Parvolute**

*Purpurine.* (177). S.G. \( \frac{1}{2} \) 8628; \( \frac{1}{2} \) 8542; \( \frac{1}{2} \) 8474. Formed at the same time as di-methyl-ethyl-pyridine (198°), when propionic aldehyde-ammonium bromide and propionic aldehyde are heated together at 200°. Formed also by reducing the same di-methyl-ethyl-pyridine by adding sodium to its alcoholic solution (Dürkopf a. Götsch, B. 23, 690). Very mobile colourless liquid, with penetrating odour like rotten hay, v. sol. ether and alcohol, sl. sol. water. Strongly alkaline in reaction.

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**Di-methyl-ethyl-pyridine hydrochloride**

\[ \text{C}_8\text{H}_8\text{N} \text{CHMe.C.H}_4 \text{C.H}_4 \text{C.H}_4 \text{Cl} \]  

**Parvolute**

*Purpurine.* (177). S.G. \( \frac{1}{2} \) 8628; \( \frac{1}{2} \) 8542; \( \frac{1}{2} \) 8474. Formed at the same time as di-methyl-ethyl-pyridine (198°), when propionic aldehyde-ammonium bromide and propionic aldehyde are heated together at 200°. Formed also by reducing the same di-methyl-ethyl-pyridine by adding sodium to its alcoholic solution (Dürkopf a. Götsch, B. 23, 690). Very mobile colourless liquid, with penetrating odour like rotten hay, v. sol. ether and alcohol, sl. sol. water. Strongly alkaline in reaction.

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METHYL-ETHYL-QUINOLINE.

less needles. — B'HI* : very long colourless needles, v. sol. hot water, very sparingly in cold. — B'H₂O₃PCl₄; large plates. — B'Cl₂(N₃O)₃OH: [187°]; nearly insoluble yellow needles. Methyl-iodide B'Mel 2aq: white needles. Gives (B'MeCl)₂PCl₅: small glistening orange-red needles.

(B. 1or3 Py. 2)-Di-methyl-(Py. 3)-ethyl-quinoline C₇H₅(CH₃)₂CH(C₆H₅)₃[11°]. (288°- 292°) at 720 mm.). Formed by the action of propionic aldehyde and HCl upon m-toluidine (Harz, B. 18, 3397). Colourlessness trimeric hexagonal plates. It is reduced by tin and HCl to a tetra-hydrate, which is a colourless oil of boiling point 282°-285° at 720 mm.

Salts. — B'HCl*: easily soluble colourless prisms. — B'HI*: long colourless needles, soluble in hot water, very sparingly in cold. — B'H₂H₂Cl₂P₂Cl₄: orange plates or fine needles, sl. sol. cold water. — B'Cl₂H₂(N₃O)₃OH: [290°]; yellow needles, sol. hot alcohol, nearly insol. water.

Methyl-iodide B'Mel 2aq: yellow needles, v. sol. hot water; gives (B'MeCl)₂PCl₅: small glistening orange-red crystals.

(B. 2-Py. 2)-Di-methyl-(Py. 3)-ethyl-quinoline C₇H₅(CH₃)₂CH(C₆H₅)₃[54°]. (288° at 720 mm.). Prepared by adding propionic aldehyde (60 g.) to a cooled mixture of p-toluidine (60 g.) and strong HCl (90 g.), finally heating for a short time on the water-bath. White trimeric crystals. Sparingly volatile with steam. V. sol. alcohol, ether, and benzene, insol. water. It is reduced by tin and HCl to a tetra-hydrate. (286°). It combines with bormine, forming a dibromide, which crystallises in yellow needles [91°]. By CrCl₃ and dilute H₂SO₄, it is oxidised to (B. 2)-methyl-(Py. 3)-ethyl-quinoline (Py. 2)-carboxylic acid.


Methyl-iodide B'Mel 2aq: [218°]: monoclinic yellow crystals. Methyl-chloride B'MeCl, colourless soluble needles. — (B'MeCl)₂PCl₅.

Ethyl-iodide B'Et 2aq: [114°]; small yellow crystals. — (B'EtCl)₂PCl₅: glistening crystals (Harz, B. 18, 3854).


(Py. 3,4)-Methyl-ethyl-quinoline tetrahydride C₉H₅(CH₃)₂CH(C₆H₅)₃[292° at 720°]. mm.). Formed by reduction of (Py. 2,3)-methyl-ethyl-quinoline with tin and HCl (Dabner a. Miller, B. 17, 1716). Colourless liquid. Fe₃O₄ gives a red colouration. — B'HCl*: sparingly soluble colourless concentrate fuids.

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METHYL ETHYL SULPHONE.

(B. 3-Py. 2:4). Tri-methyl-(Py. 3)-ethyl-quinoline tetrahydroxide C₆H₅(CH₃)CH₂ - CH(CH₃)₂ - N(CH₃)CH₂CH(H₃)₂
(275°-280° at 720 mm.). Oil. Formed by heating (B. 2-Py. 2) di-methyl-(Py. 3) ethyl-quinoline tetrahydroxide with methyl iodide.

(B. 2-Py. 2). Tri-methyl-(Py. 3) ethyl-quinoline tetrahydroxide C₆H₅N₃O₂ (288°). Formed by reducing the corresponding tri-methyl-quinoline (Waldbott, B. 23, 2272). Oil.

B₄C₉H₅(NO₃)₂OH [146°]

(B. 2-Py. 3)-ETHYL-QUINOLINE CARBOXYLIC ACID

C₆H₅(CH₃)CH₂COOH

[143°]. Formed by oxidation of (B. 3-Py. 2)-di-methyl-(Py. 3)-ethyl-quinoline with CrO₃ and dilute H₂SO₄ (Hars, B. 18, 3892; Daniel, B. 23, 2266). Triclinic needles, prism or platina (containing aq). Sol. water and alcohol. Yields on distillation methyl-ethyl-quinoline [60°].


Ethyl ether Et₂Na₂aq. [170°-190°]. Decomposed on fusion (Hars, B. 18, 3894). Methyl-ethyl quinoline (B. 4)-carboxylic acid

C₆H₅(CH₃)CH₂COOH


(B. 2-Py. 2). Di-methyl-(Py. 3)-ethyl-quinoline (B. 4)-carboxylic acid C₆H₅(C₂H₅)₂COOH i.e.

C₆H₅(CH₃)CH₂COOH

[183°]. Formed by oxidising (B. 2-Py. 2)-tri-methyl-(Py. 3)-ethyl-quinoline by CrO₃ and H₂SO₄ (Jungmann, B. 23, 2266) with insol. water. Red crystals. On distillation it gives CO₂ and (B. 2-Py. 2)-di-methyl-(Py. 3)-ethyl-quinoline [254°].

(B. 2-Py. 3)-ETHYL-QUINOLINE CARBOXYLIC ALDEHYDE C₆H₅NO i.e.

C₆H₅CHO

[57°]. (above 300°).

Formed, in small quantity, in the preparation of the preceding acid (Hars, B. 18, 3397). Large triclinic prisms (from ether), not very volatile with steam. Reduces ammoniacal AgNO₃. Ag₂O oxidises it to the corresponding acid (Daniel, B. 23, 2267).

(B. 2-Py. 2). DI-METHYL-(Py. 3). ETHYL-QUINOLINE SULPHONIC ACID C₆H₅(N₃O₂)SO₃H

[290°]. Formed by heating di-methyl-ethyl-quinoline with fuming sulphuric acid (20 p.c. SO₃) (Hars, B. 18, 3898). White silky scales or thick triclinic crystals. Easily soluble in hot water, sparingly in cold; insol. strong alcohol.


METHYL-ETHYL-SULPHONIC

C₆H₅MeO₂(SO₃H) [144°]. Obtained by heating with HCl its mono-ethyl derivative C₆H₅MeO₂(CHO)(OEt) which is formed, together with the di-ethyl ether of oxin, by treating oxin with EtOH and KOH (Herzig a. Zeisel, M. 11, 319). Needles, insol. water. v. sol. ether. Neutralises only 1 mol. NaOH.

Acetyl derivative C₆Me₃Et₂O(OAc)(OH). [78°]. Monoclinic needles.

METHYL-TRI-METHYL-SULPHONIC ACID C₆H₅(C₂H₅)₃SO₃H, i.e. Me₃Et₃SO₃H (156°). S.G. 2.999. Formed from Me₃SiCl by the action of EtOH (Friedel a. Crafts, A. Ch. [4] 9, 32).

Di-methyl ethyl silicate Me₂Et₃SiOH. [143°-146°]. V.D. 6.18 (calc. 6.23). S.G. 2.1004. Formed from MeOH and Et₃SiO. Formed also by the action of EtOH on (Me₃)₂SiCl. Liquid.

Tri-methyl ethyl silicate Me₃Et₃SiOH. (134°). S.G. 2.1029. Formed from (Me₃)₂SiCl and EtOH.


METHYL-ETHYL-SUCINIC ACID

C₆H₅(C₂H₅)₂CH₂C₄H₄O₂ i.e. C₆H₅.CH₂CH₂CH₂CO₂H [169°-175°]. Formed by the action of H₂SO₄ on pentane tricarboxylic ether (Bischoff a. Walden, B. 22, 1817). It is accompanied by the isomeric 'meso' acid [88°] (Bischoff a. Mintz, B. 23, 647). The same acid [160°] appears to be formed in small quantities in the saponification of C₆H₅.CH₂CH₂CH₂CO₂Et, C₆H₅.CH₂CH₂C₄H₄O₂Et with HCl (Young, O. 43, 186). White crystals.

Di-methyl-ethyl-succinic acid C₆H₅(C₂H₅)₂CH₂C₄H₄O₂ i.e. C₆H₅.CH₂CH₂CH₂CH₂CO₂H. Formed by the action of H₂SO₄ on the product of the action of a bromo-isobutyric ether on sodium-ethyl-malonic ether (Bischoff a. Mintz, B. 23, 651). It occurs in two varieties, one melting at 63° the other at 105°.

DI-METHYL-DI-ETHYL-SULPHAMIDE

C₆H₅(C₂H₅)₂N₂O₂ i.e. O₂NMe₂[NET₄] [229°]. Formed by the action of di-ethyl-amine on di-methyl-amido-sulphonlic chloride, or of di-ethyl-amine on di-ethyl-amido-sulphonlic chloride (Behrend, B. 16, 1610; A. 223, 123, 130). Volatile with steam. Heavy oil. Insol. water, sol. alcohol, ether, and benzene.


Methyl-iodide Et₅SiI v. DI-METHYL-SULPHIDE ethyl-iodide.


METHYL. ETHYL - SULPHONAMIDE v. METHYL-ETHYL-SULPHAMIDE.

METHYL ETHYL SULPHONE CARBOXYLIC ACID

**Methyl Ethyl Sulphone Carboxylic Acid** \( C_2H_5SO_2 \), i.e. \( \text{EtSO}_2\text{Cl} \), is made by heating its ether with cold conc. KOH. Formed also by oxidising the barium salt of the ethyl derivative of thioglycollic acid with \( \text{KMnO}_4 \) (Glaesson, *B.", 23, 447). Thick colourless syrup. At 190° it splits up into \( \text{CO}_2 \) and methyl ethyl sulphone [36°]. Bromine added to its aqueous solution gives a smoky methyl ethyl sulphone. Zinc and \( \text{HCl} \) reduce it to ethyl mercapto.

**Salm.**—NaA. Pearly plates, v. sl. sol. hot alcohol, v. sol. water.—K\( \text{A} \). Small tables (from alcohol).—BaA\( \text{q} \). Nodules. —Ca\( \text{A} \), 2aq. Broad tables.

**Ethyl Ether EtA.** Formed by the action of chloro-acetic ether on sodium ethane-sulphinic acid (Clausen, *J. pr.*, 2, 15, 293; Otto, *B.,* 21, 993).

**Methyl-Ethyl-Thiazole**

\[ \text{CH}_2\text{CN} \]

**Methyl Ethyl Dithiocarbonate** v.

**Methyl-ethyl-thio-urea** \( \text{C}_2\text{H}_5\text{NS} \), i.e. \( \text{NHMe.CH.NH} \). [54°]. Formed by addition of thio-urea to thiaoanilide (Hoffmann, *B.,* 1, 27; *Z.,* 1808, 655). Fine crystals, sol. with alcohol, and HCl ether.

**Methyl-di-ethyl-thio-urea** \( \text{C}_2\text{H}_5\text{NS} \), i.e. \( \text{NMe.CH.NMe} \). Formed from di-ethyl-thione and \( \text{Me} \) (Noah, B. 23, 2196). Oil. With alcoholic \( \text{NH} \), at 100° it yields methyl-guanidine and MeSH. —B\( \cdot \text{HCl} \). —B\( \cdot \text{HCl.PCl}_3 \). —B\( \cdot \text{HCl.PCl}_3 \)

**Methyl-ethyl-toluquinolone** v.

**Methyl-ethyl-quinoline**

**Methyl-ethyl-thio-urea** \( \text{C}_2\text{H}_5\text{NS} \), i.e. \( \text{NHMe.CH.NH} \). [53°]. (287°) (Wurtz, *Rép. chim.,* 4, 197).—B\( \cdot \text{HCl} \) (Schreiner).

**Methyl** from methylamine and ethanol ether (Wurtz). When methylamine acts on ethyl carbamido ether there is formed a methyl-ethylenen which melts at 105° and solidifies again at 101°. When, on the other hand, ethylamine acts on methyl-carbamido ether the methyl-ethylenen which is produced melts at 76° and solidifies again at 72° (Schreiner, *Ja pr.*, 2, 22, 360), After frequent molassings and solidifications, these two forms begin to melt at 92° and end at 112°.

**Methyl-Eugetic Acid** v. Methyl derivative of Eugenic Acid.

**Methyl-ethyl-penicillin** v. Iso-penicillin and the dimethyl derivative of Cafféine Acid, vol. i p. 659.

**Methyl-flavoline hydrate** v. methyl-hydrate of (Py. 3:1): Phenyl-methylquinoline (flavoline).

**Methyl-fluorescein** v. so-called ‘homoflavenes’, vol. ii p. 658.

**Methyl fluoridone** CH.F. V. D. 1-23 (calcd. 1-19). S. 1-66 at 15° (D. A. P.). Formed, together with \( \text{MeO} \), by the action of \( \text{KF} \) on \( \text{MeSO}_2 \) (Dumas a. Péligot, A. 16, 59). Formed also, in small quantity, together with \( \text{Me}_2 \), by heating \( \text{NMe}_2 \) at 180° in vacuo (Lawson a. Collie, C. J. 65, 628; 65, 110). Prepared by the action of \( \text{Me} \) upon silver fluoride (Molins, *C. R.*, 107, 1155). Gas, sl. sol. water, v. sol. alcohol and \( \text{Me} \). Jéquiped by a pressure of 30 atmospheres. It burns with a blue flame, yielding HF. Saponified by difficulty by heating in sealed tubes with water or dilute aqueous KOH at 120°. In the presence of a little water it forms a crystalline hydrate, decomposing at 18-5° (Villard, C. R. 111, 118). Chlorine, acting upon it in sunlight, forms \( \text{CHCl}_3 \), a gas which is decomposed by water, and is hardly inflammable.

**Methyl-formamide** v. Formamide in the article on Formic Acid.

Di-methyl-formamide C.H.N, i.e. \( \text{NMe}_2 \text{CH.N} \). Form-imid-di-methyl-amida. Formed by the action of an alcoholic solution of di-methyl-amine on the hydrochloride of formimido-ether (Pinner, B. 16, 1850).—B\( \cdot \text{HCl} \): thick prisms, [160°].—v. sol. water and alcohol.

**Methyl-fluoromorphicamide** \( \text{NMeCH.NMe} \). Form-methyl-imid-methyl-amida. Formed by the action of an alcoholic solution of methyl-amine on the hydrochloride of formimido-ether \( \text{NH.CH.OE} \).—B\( \cdot \text{HCl.PCl}_3 \);—short red prisms, [172°] (Pinner, B. 16, 658, 1648).

**Methyl-formanilide** v. Formic Acid.

**Di-methyl-fumaric acid** v. Di-methyl-cumaric acid.

**Methyl-fururaldehyde** C.H.O, i.e. C.H.Me.OCHO. Methyl-furfural. (187° i.v.). S. 8.8. Appears to accompany furfuraldehyde in the product of the dry distillation of wood (Hill, B. 22, 607). Formed also by distilling isocitrate with dilute \( \text{H}_2\text{SO}_4 \) (Maquenne, C. R. 109, 604). According to Bieler a. Tolls (A. 259, 110; B. 22, 3652) furacol or fuce aldehyde (g. c.) is a mixture of furfuraldehyde and methyl-furfuraldehyde. Combin the with \( \text{NaHSO}_4 \). Aqueous ammonia converts it into crystalline methyl-furfuramic acid \( \text{NMe.CH.OH} \) (387°). Yields, on oxidation, methyl-pyromucic acid \( \text{C}_2\text{H}_5\text{O}_3 \). Reduces \( \text{AgO} \). Gives Schiff’s reaction with rosiniline and \( \text{SO}_4 \). Its phenyl-hydrazide is liquid. With resorcin and HCl it yields an orange-yellow condensation-product. Fyrogallol and HCl form a crimson paper. Powder moistened with aniline acetate is coloured yellow, and finally deep orange-red by an aqueous solution of methyl-furfuraldehyde.

(aq.) **Di-methyl-furfurane** C.H.O, i.e. CMe.CH.

**Formation.**—1. By dry distillation of pyrotritaric or carboxytritaric acid; the yield being 5-7 p.c. —2. By distilling acetonyl-acetone \( \text{CH}_3\text{CO.CH}_2\text{CO.CH}_3 \) with \( \text{ZnCl}_2 \); the yield being 25 p.c. (Districh, B. 20, 1885).—3. Occurs also in the product obtained by distilling sugar (1 p.c.) with time (1 p.c.) (E. Fischer a. Lydock, B. 22, 101).

**Properties.**—Colourless mobile very volatile liquid of characteristic odour. Insol. water; miscible with other solvents. Does not react with phenyl-hydrazine. By POCl, or POCl, it is readily. Formed by heating with sanguineous water it is converted back into acetonyl-acetone.