

the plane 010, and they make with each other a small angle which is bisected by the line [100].

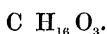
A crystal having two opposite faces of the form 110 much larger than the two remaining faces, being immersed in oil for which $\mu=1.4793$, and placed in a polarizing apparatus, the rings surrounding the optic axes were seen through the large faces of the form 110. The angle included between the directions of the optic axes within the oil was about 4° .

III. "On the Synthesis of Leucic Acid." By Dr. EDWARD FRANKLAND, F.R.S. Received December 26, 1862.

When oxalic ether is mixed with more than its own weight of zincethyl, the temperature of the mixture slowly rises, and soon considerable quantities of gas begin to be evolved, unless the heat be moderated by plunging the vessel, in which the reaction takes place, into cold water. The gas consists of equal volumes of ethylene and hydride of ethyl; and as it is the product of a secondary decomposition, its evolution should be avoided as much as possible in the manner just indicated. The final application of a gentle heat completes the reaction.

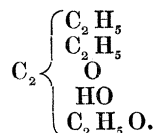
The mixture generally continues fluid, but it becomes of a light straw-colour, and of an oily consistency. On being heated to 130° C. in a retort, no distillate passes over. If, after cooling, its own volume of water be very gradually added to it, torrents of hydride of ethyl, derived from excess of zincethyl, are evolved. By subsequent distillation in a water-bath, weak alcohol containing an ethereal oil in solution passes over; and a further quantity of the oil may be obtained by adding water to the residue in the retort, and continuing the distillation upon a sand-bath. The ethereal oil was precipitated from the alcoholic distillate by the addition of water, and was added to that which floated upon the surface of the aqueous distillate. It was then dried over chloride of calcium, and rectified. A very large proportion of the liquid distilled between 174° and 176° C., and was collected apart.

Numerous analyses of this liquid agree closely with the formula*

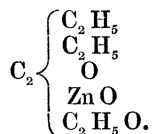


* C=12, O=16.

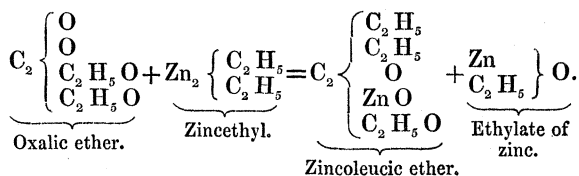
The liquid is in fact the ethylic ether of an acid possessing the same composition as the leucic acid obtained by Strecker* in acting on leucin by nitrous acid. Upon the oxalic acid type its formula may be thus expressed :



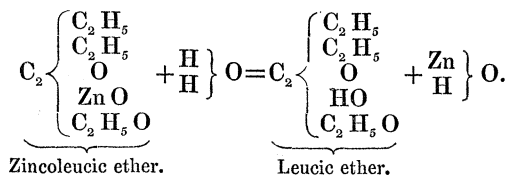
Leucic ether cannot be directly derived from the action of zincethyl upon oxalic ether, but it is produced when water is added to the result of that reaction. There can scarcely be a doubt that the body first formed is *zincoleucic ether*,



I have not succeeded in isolating this body ; but, on the assumption of its production, the action of zincethyl upon oxalic ether may be thus formulated :



In contact with water zincoleucic ether is decomposed with the formation of leucic ether and hydrated oxide of zinc :

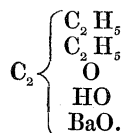


Leucic ether is a colourless, transparent, and somewhat oily liquid, possessing a peculiar and penetrating ethereal odour and a sharp taste. It is insoluble in water, but readily soluble in alcohol or ether. Its specific gravity is .9613 at 18°.7 C. ; it boils at 175° C.,

* Ann. der Chem. u. Pharm., Bd. lxxviii. 54.

and distils unchanged. A determination of the density of its vapour gave the number 5.241 : the above formula, corresponding to 2 vols. of vapour*, requires the number 5.528.

When leucic ether is treated with solution of hydrate of baryta, it gradually dissolves even in the cold ; on heating the solution in a water-bath, a liquid having the properties of alcohol distils off ; and on separating the excess of baryta by carbonic acid and filtration, the solution yields, on evaporation, a crystallizable baryta-salt which, after drying at 100° C., gives on analysis numbers closely corresponding with the formula of leucate of baryta :



Leucate of potash is similarly produced when leucic ether is treated with an aqueous solution of caustic potash. It separates as a semisolid soap upon the surface of the potash solution, if the latter be concentrated. All the salts of this acid appear to be soluble in water.

Leucic acid in solution is obtained when dilute sulphuric acid is added to leucate of baryta ; the acid has a sour taste, reddens litmus strongly, and is readily soluble both in water and alcohol. It can be boiled with water without decomposition, and traces only of the acid distil off with the water.

So far as I have studied its properties, leucic acid thus obtained appears to be identical with that derived from leucin ; but it will be necessary to establish this identity by a more rigorous comparison of the two acids.

The production of leucic acid from oxalic acid, as just described, obviously affords an insight into the molecular constitution of the class of organic acids of which lactic acid is the representative ; I refrain, however, from offering any opinion upon a point which has already given rise to so many hypotheses, until I have completed the study of this reaction, and extended it to other homologous bodies.

* $\text{H}_2 \text{O} = 2$ volumes.