The results indicate that the number of smoke particles per c.c. varies between 1200 to 4000 per c.c.

I thank the Commission for the permission to publish these results.

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September 1934.

Dry Ether as Solvent for Anhydrous Aluminium Chloride in Organic Synthesis.

THE author has made the interesting observation that dry ether which has the remarkable property of readily dissolving anhydrous aluminium chloride can be advantageously used for some reactions of the Friedal-Crafts' type which take place under mild conditions, *i.e.*, at or below the boiling point of ether.

Anhydrous aluminium chloride when added to dry ether quickly dissolves with evolution of heat and a clear colourless solution results in which the aluminium chloride is present in the form of a double compound with ether, $AlCl_3$, $C_4H_{10}O$.[1] This solution can directly be used for synthesis.

The author observed that the condensation of benzanilide-imido-chloride with polyhydric phenols in the presence of aluminium chloride to give anils of polyhydroxybenzophenones, proceeds best with dry ether as solvent. Ichaporia, working in this laboratory, has also found the use of dry ether as solvent advantageous for Shah and Chaubal's synthesis of dialkylaminobenzophenones[2] in which a benzanilide-imido-chloride is condensed with an aromatic tertiary amine with aluminium chloride as condensing agent. It is also found that a solution of aluminium chloride in ether can be used in place of a suspension of zinc chloride in ether for the Hoesch synthesis, *e.g.*, for the preparation of 2: 4-dihydroxybenzophenone from benzonitrile and resorcinol. All of these reactions are carried out in cold ethereal solution.

Ether would appear to offer an obvious advantage over some of the usual diluents like carbon disulphide, benzene, petroleum ether, in which aluminium chloride is insoluble. With ether as solvent, the reaction can be carried out in homogeneous solution.

The principal drawback to the general use of ether for this purpose is its tendency to react in some cases in the presence of aluminium chloride, the carbon-oxygen bond in ether being broken. The mixture of benzoyl chloride and aluminium chloride reacts with ether to give ethyl benzoate[3]. Triphenyl chloromethane in the presence of aluminium chloride and ether gives triphenyl methyl ethyl ether, which further gives by decomposition triphenylmethane and acetaldehyde.[4] The action of ether and aluminium chloride on diphenyl-dichloromethane is stated by the same author[5] to give benzophenone. It may be pointed out, however, that it seems more likely that no reaction takes place in the last case, and that the formation of benzophenone might be due to simple hydrolysis of the easily hydrolysable diphenyldichloromethane on subsequent treatment with water. Ether has also been known to act as an ethylating agent in the presence of aluminium chloride, but this requires high temperatures. Thus Jannasch and Rathjen[6] obtained diethyl phenol by heating phenol, ethyl ether and aluminium chloride at 145°. They similarly prepared hexaethyl benzene from benzene, ethyl ether and aluminium chloride.[7]

A detailed account of the experiments above referred to will be published elsewhere.

Attention is directed to the author's observation in as much as it may find application in some of the numerous organic reactions requiring the use of aluminium chloride as a condensing agent, which take place at relatively low temperatures.

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The Biological Oxidation of Inositol.

INVESTIGATIONS have been carried out on the oxidation of inositol *in vitro* by animal tissues. The wide occurrence of inositol in plant and animal tissues would suggest

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[1] *Cf.* Walker and Spencer, *J.C.S.*, 1904, **85**, 1106; Frankforter and Daniels, *J. Am. Chem. Soc.*, 1915, **37**, 2560.

[2] *J.*, 1932, 650.

[3] Norris, *J. Am. Chem. Soc.*, 1924, **46**, 2580.

[4] Norris, *loc. cit.*

[5] Norris, *loc. cit.*

[6] *Ber.*, 1899, **32**, 2391.

[7] *Ber.*, 1898, **31**, 1716.

that it has some important function which is not yet understood. We have carried out some experiments with the brain, heart, kidney and liver tissues of normal adult albino rats which have been fed on our standard mixed diet.

In the case of minced brain tissues, both washed and unwashed, inositol is oxidised. Minced heart muscle, also both washed and unwashed, gives an additional oxygen uptake with inositol. Kidney tissues have been studied, sliced as well as washed after mincing, and have been found to oxidise inositol. Liver tissues also appear to oxidise inositol though at a low rate.

The experiments were carried out with the Barcroft-Warburg apparatus in the usual way. The temperature of the thermostat was maintained at $37° \cdot 3 \pm 0 \cdot 1$. The medium in which the tissues were suspended consisted of phosphate buffer at pH 7.4 and Ringer-Locke solution.

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A Preliminary Note on the Morphology of the Aerial and Underground Flowers of *Commelina benghalensis*, Linn.

Although a very common weed, *Commelina benghalensis* is of great interest because of the presence of underground flowers in addition to the normal aerial ones. In the Indo-Gangetic Plains, this plant usually makes its appearance in the month of July and dies down towards the close of October. An examination of the spathes reveals the fact that each has usually three flowers enclosed within it. One of these and the first to develop has a longer pedicel than the other two, and is purely male (Fig. 1). Of the other two, which are hermaphrodite, one opens in the usual way and is chasmogamous (Fig. 2 B), while the other remains closed and is therefore cleistogamous (Fig. 2 C). The first flower naturally sets no seed and soon withers and drops off (Fig. 2 A). Of the other two, the chasmogamous produces seeds first and the cleistogamous a little afterward. Only the former comes out of the spathe; the latter remains bathed in the slimy fluid secreted within the spathe.

Each flower has 3 perfect stamens of which one is yellow and is larger than the two laterals which have a sky-blue colour. In addition to these there are 2 or 3 staminodes which are sterile. In some cases a very few pollen grains have been seen in the anthers of the staminodes also, but it is not likely that they are of any use in fertilisation.

In addition to the blue aerial flowers mentioned above, every plant produces a large number of cleistogamous flowers borne on branches produced from the lower part of the stem (Fig. 3), which penetrate into the ground. While the aerial flowers occasionally fail to ripen, the underground ones are very fertile and the seeds are self-sown in the soil. A very similar condition has been reported by Hagerup[1] in *Commelina forskalei*.

The following account of the development of the gametophytes applies to both kinds of flowers, unless it is specially mentioned otherwise.

Microsporogenesis.—The early development of the anther presents no unusual features. The primary parietal layer divides periclinally to give rise to the endothesium, one middle layer and tapetum. The nuclear divisions in the latter are mitotic and the cells become binucleate at or even before the time of synizesis in the microspore mother cells. By the time the reduction divisions are over, the walls of the tapetal cells disorganise and the contents give rise to a true periplasmodium. It is noteworthy to record the presence of crystals of Calcium oxalate in the periplasmodium as also seen by Mascre[2] (1925) in *Tradescantia virginica* L. While they are not distinguishable in sections prepared according to the usual methods, they can be readily seen by crushing a fresh anther on a slide and examining it without any treatment whatever. At the microspore stage some rod-like bodies are also conspicuous in the periplasmodium (Fig. 6), but we have not been able to determine their exact nature so far. During the maturation of the male gametophyte, the nuclei of the tapetum begin to degenerate and finally the

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1 Hagerup, O., "On pollination in the extremely hot air at Timbucto," *Dansk. Bot. Arkiv.*, 1932, **8**, 1-20.

2 Mascre, M., "Sur l'evolution de l'etamine des Commelinacees," *Bull. Soc. Bot., France*, 1925, **72**, 1060-1066.