quartz tubes. The formic acid does not appear to be used up appreciably during the reaction, titration showing that practically as much remained at the end as was introduced initially.

Detailed considerations of these experiments have led us to the view that the polymerisation of formaldehyde, induced by formic acid, proceeds by a chain mechanism, in which the starting of reaction chains and also the branching are controlled kinetically by the formic acid.

The results suggest that it is probable that the stability of monomeric formaldehyde depends mainly upon its freedom from traces of formic acid vapour.

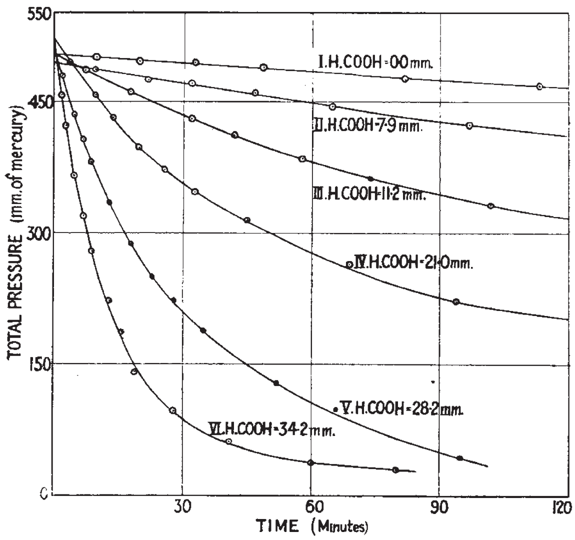


Fig. 1. Polymerisation of formaldehyde catalysed by formic acid.

We have found, further, that acetic acid is efficient as a polymerising agent, while preliminary experiments with acetaldehyde vapour at room temperature show that a similar polymerisation may be induced by formic acid. In this case the pure aldehyde appeared to be perfectly stable, but addition of 25·3 mm. of formic acid vapour to 298·2 mm. of acetaldehyde caused the pressure to fall at an initial rate of about 2 mm. per minute, and brought about a total diminution of pressure amounting to 162·7 mm. of mercury.

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## Concentration and Ionising Tendency of Carboxylic Acid Groups in Cellulose and other Natural Products

Cellulose which has been subjected to oxidation with an alkaline oxidant is presumed to contain carboxylic acid groups, but does not show acid characteristics of the order usually associated with this group. The reason for this is that, whilst the carboxylic acid groups are ionised *within the cellulose phase*, the hydrions are unable to escape into external water, since the anions form part of the cellulose lattice.

A theoretical consideration of the ionic equilibria in the system 'oxycellulose' – dyestuff – water led to the expectation that the constraint on the movement of the hydrions would be overcome by the addition of a neutral electrolyte. Indeed, if the Donnan theory of membrane equilibrium is applicable, in presence of excess sodium chloride, the concentration of sodion, and therefore that of hydrion, in the external solution should become equal to the respective concentrations within the fibre.

A qualitative experiment showed in a striking manner the existence of this effect. A sample of 'oxycellulose', washed until the washings were neutral, was placed in water and methyl red (*p*H 4·2–6·3) added. The colour changed slowly towards a final *p*H of 5, on account of interchange between the indicator sodions (present in very low concentrations) and the carboxylic acid hydrions. When sodium chloride was added a very marked further change took place. Acid 'streamed' out the fabric and in a few seconds the colour indicated a *p*H below 4.

In the presence of excess sodium chloride, 'oxycellulose' becomes sufficiently acid to be titrated directly with sodium hydroxide, using an indicator turning slightly on the acid side of the neutral point. A ready method of determining the content of carboxylic acid groups is thus provided. Moreover, by the determination of the change of *p*H with salt concentration, it should be possible to evaluate the ionisation constant of the carboxylic acid groups.

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## A New Type of Anomodont Reptile

It is almost a hundred years since the first Anomodont reptile was discovered in South Africa by Andrew Geddes Bain. This skull was sent to Owen and in 1844 he described it under the name *Dicynodon lacerticeps*. Numerous other *Dicynodon* skulls were afterwards sent to London and are now in the British Museum (Natural History). The typical *Dicynodon* is very mammal-like in much of its structure, but is remarkable in having had a horny beak something like that of the tortoise, with in addition in the male a powerful permanently growing tusk in each maxilla and no other teeth.

During the latter half of the nineteenth century many species of *Dicynodon* were described, and a number of other genera more or less allied to it; and in the last thirty years our knowledge has increased so greatly that we now know about 130 species of *Dicynodon* and its allies. These are grouped in an order called the *Anomodontia*. Some have tusks in both sexes: some have no tusks in either sex. Some have a row or a number of rows of molar teeth. But all agree in that the premaxillaries are fused to form a beak, and hitherto no species has been known in which there are any teeth in the premaxillaries.

A couple of months ago I discovered in beds of the *Endothiodon* zone of the Karroo an imperfect little skull, which on being developed reveals a new type of palate in that there is a number of teeth on the premaxillaries. In many respects the skull resembles that of some of the small Endothiodonts, such as *Cryptocynodon* of Seeley, or *Prodicynodon* or *Emyduranus*; but the presence of at least seven teeth on each premaxilla separates it markedly from all previously known *Anomodonts*. These teeth are not like incisors, growing from the front of the