Summary.

1. It has been shown that the reaction which takes place when *p*-xylene is treated with trioxymethylene in the presence of anhydrous aluminum chloride does not conform with the equation of Frankforter and Kokatnur.

2. Three new compounds resulting from the above reaction have been isolated and described. The molecular formalae of two of these have been determined and structural formulae are suggested.

3. It has been shown that molecular-weight determinations are essential factors in determining the formulae of substances of the types described.

4. The evidence at hand would seem to indicate that trioxymethylene is dissociated into formaldehyde, and this last is the active agent in the condensation reactions.

EAST LANSING, MICH.

THE ACTION OF TRIOXYMETHYLENE ON THE VARIOUS HYDROCARBONS IN THE PRESENCE OF ALUMINUM CHLORIDE.

BY G. B. FRANKFORTER AND V. KOKATNUR.[1]

Received August 24, 1915.

Through the courtesy of the editor, we have just received a copy of a paper by Huston and Ewing, entitled "The Action of Trioxymethylene on *p*-Xylene in Presence of Aluminum Chloride," representing a line of investigation begun by us and on which we are working at the present time. As the paper referred to expresses doubt as to the conclusions drawn in our preliminary work,[2] we feel obliged to make a statement concerning our work, so that the readers of the JOURNAL, who are too busily engaged in their own chosen field to become thoroughly familiar with the details of our own, may grasp the general outline of our work and the relation of the paper by Huston and Ewing to it.

We indicated in our preliminary paper our intention to continue the work in this special field. We were therefore somewhat surprised to find that others should have taken up this work. We thought we made it clear that we intended to continue our work with other hydrocarbons, as we have done and are doing on both the aliphatic and the aromatic hydrocarbons. We were even more surprised at some of their conclusions. It appears that they question all our work on benzene, toluene, *o*-xylene, etc., from their work on *p*-xylene. If they do, it would be equivalent to questioning the formation of phthalic anhydride from *o*-xylene, because it is not so formed from *p*-xylene.

We wish to emphasize the fact that the object of our preliminary paper

---

[1] An explanation of our former paper of the above title.

[2] THIS JOURNAL, 36, 1529 (1914).

was: First, to determine whether or not the reactions studied by Kritchevsky and one of us[1] could be extended to other aldehydes, *e. g.*, trioxymethylene, etc.; second, to determine whether or not trioxymethylene derivatives analogous to those obtained by Grassie and Masseli,[2] could be prepared. We will state that we started out with formaldehyde, but soon changed to trioxymethylene because it seemed more interesting and especially because it was more convenient to work with, intending later on, if it seemed desirable, to take up formaldehyde. This has not yet been done in view of the fact that we were unable to obtain any of the oxy-compounds of trioxymethylene. It was assumed, therefore, that formaldehyde would probably form the same compounds as trioxymethylene. We have nowhere stated that trioxymethylene does not act in the presence of aluminum chloride like formaldehyde in the presence of aluminum chloride for the reason that we have not as yet studied formaldehyde.

That benzene and trioxymethylene in the presence of aluminum chloride form as a part of the reaction diphenylmethane and anthracene, there can be no doubt. Inasmuch as these two compounds were the principal ones which we isolated, we believe that we were justified in expressing their formation by the following equation:

$$4C_6H_6 + (CH_2O)_3 + AlCl_3 = CH_2(C_6H_5)_2 + C_{14}H_{10} + 3H_2O + AlCl_3 + H_2$$

We will state that we used the formula $(CH_2O)_3$ for the simple reason that we used trioxymethylene and not formaldehyde. Whether or not trioxymethylene will act like formaldehyde has nothing to do with the case.

We are quite as positive that ditoluyl methane and dimethylanthracene are formed from toluene and trioxymethylene in the presence of aluminum chloride.

We are equally confident that dixylylmethane and tetramethylanthracene are formed from *o*-xylene and trioxymethylene in the presence of aluminum chloride. As already stated, we did not determine the molecular weights of the above compounds inasmuch as they were identified as diphenylmethane and anthracene derivatives. Since reading Huston and Ewing's paper, however, we have made a molecular-weight determination of the compound which we designated as tetramethylanthracene from *o*-xylene, a compound made for the first time by us. We found the molecular weight to be 219. The molecular weight of tetramethylanthracene is 234.

Finally, from the conclusions drawn above, we felt justified in assuming that mesitylene would form an anthracene derivative, although we were

---

[1] This Journal, 36, 1511 (1914).

[2] *Gaz.*, 28, 477

not able to positively identify it. This work is still under way. It was delayed several months on account of the fact that we were forced out of the old laboratory before the new one was completed.

MINNEAPOLIS, MINN.

THE ACTION OF TRIOXYMETHYLENE ON *p*-XYLENE IN THE PRESENCE OF ALUMINUM CHLORIDE. II.

BY RALPH C. HUSTON AND DWIGHT T. EWING.

Received September 6, 1915.

The editors have kindly forwarded us a copy of the preceding article by Frankforter and Kokatnur. In order that the position taken in our first paper on this subject may be more clearly defined we think it best to call attention to the following points:

1. It was not our purpose in taking up the work previously described by us to usurp the field of other investigators. The work was taken up in connection with other work on *p*-xylene which is being carried on in this laboratory. The results appeared to us to be worthy of publication.

2. We do not question the formation of diphenylmethane and anthracene derivatives when certain hydrocarbons are treated with trioxymethylene and aluminum chloride, but we have reason to believe that *both* are not *always* formed in appreciable amounts.

3. We do not believe that the equation of Frankforter and Kokatnur can be justified until it is shown by experimental data that diphenylmethane and anthracene derivatives are formed in equal molecular amounts. The fact that these derivatives are the principle ones isolated does not necessarily justify the equation.

4. Recent experiments in which toluene, trioxymethylene and aluminum chloride were used have led us to suspect that the relative yields of ditolylmethane and dimethylanthracene depend to some extent upon the temperature of the reacting mixture.

5. It was not our intention to give the impression that we were drawing conclusions as to the structure of the compounds described by Frankforter and Kokatnur from our work on *p*-xylene. We simply wished to point out that some of the experimental data presented by them might be interpreted in a different way.

6. We did not state in our previous paper that an anthacene compound can not be formed from mesitylene. It was shown that more than one interpretation might be placed on the data given.

EAST LANSING, MICH.