

Chemistry. — *The Formation of cis-cis-Muconic Acid and Phenoquinone in the Oxidation of Phenol with Peracetic Acid.* By J. BÖESEKEN and R. ENGELBERTS.

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Some time ago it was found that naphthalene with peracetic acid gave a fairly good yield of allo-cinnamic carbonic acid: hence that one of the benzene nuclei is cut through and opened near the other nucleus.

Then this oxidation method was applied to the orthoquinone, and actually the muconic acid was obtained, which according to this method of formation must be the cis-cis-muconic acid, and accordingly differs greatly as regards melting-point, from the muconic acid that has been known for a long time.

It was also found that benzene was not attacked. If we bring a hydroxyl group into the nucleus, the attackability is considerably increased, and peracetic acid, particularly highly concentrated acid, really acts rapidly on it.

The result of this oxidation is very remarkable: as principal product the cis-cis-muconic acid is formed; with 20 % peracetic acid 3.1 gr. of this acid was obtained from 5 gr. of phenol. Besides, however, also phenoquinone is formed.

The process of the oxidation is presumably as follows. The oxidation is directed both to the carbon atom in the ortho- and that in the para-position. The result of the first is the cleaving of the nucleus and the formation of cis-cis-muconic acid, of the latter the formation of paraquinone, which combines with two molecules of phenol, and is then separated as phenoquinone.

The para-quinone itself is not attacked, the pheno-quinone slowly: it seems as if the phenol, by its combining with the quinone, is more or less protected from the action of the peracetic acid.

Besides these main products there is also formed a little of a reducing substance, probably glyoxylic acid and maleinic acid.

The investigation is continued in various directions, in which it was found, among other things, that pyro catechol with the calculated quantity of peracetic acid gives an excellent yield of cis-cis-muconic acid. By these syntheses this acid has become very easily accessible, in our opinion this method of formation is the simplest transition from the aromatic to the aliphatic compounds.

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