

formula for chlorophyll *a* seems to offer the best explanation at present of the transformations of the predominant form and to allow for the existence of a second similar form with the methoxyl group in a different position.

CAMBRIDGE, MASSACHUSETTS

RECEIVED DECEMBER 27, 1932

PUBLISHED FEBRUARY 9, 1933

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## Notes

### The Intramolecular Rearrangement of Phenyl Ethers with the Aid of Aluminum Chloride

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The literature contains reports concerning the rearrangement of alkyl phenyl ethers to substituted phenols through the agencies of heat, zinc chloride, hydrogen chloride, sulfuric acid, sulfuric and glacial acetic acids, boron fluoride, etc.

Due to the fact that rearrangement of *m*-cresyl isopropyl ether leads to the formation of the commercially important thymol (and its isomers), this transformation has received careful study.<sup>1</sup> Niederl and Natelson first effected the reaction with a sulfuric-glacial acetic acid solution; the same products were obtained by Sowa, Nieuwland and Hinton using boron fluoride as the rearranging agent. The same products obtained by these workers are also obtained when aluminum chloride is used in the role of the agent favoring the intramolecular rearrangement. This agent simplifies the experimental procedure. It is believed that this type of rearrangement holds promise for further study into the interesting field of ether rearrangement, and a more comprehensive study is contemplated.

**Procedure.**—One mole of aluminum chloride was slowly added (twenty minutes) to one mole of *m*-cresyl isopropyl ether contained in a flask surrounded by a cooling bath. Heat was evolved, and the liquid became discolored. The mixture was allowed to stand for twenty-four hours and then hydrolyzed with ice water. The organic liquid which then separated was water washed and distilled. Practically all the liquid came over between 228 and 224°; it has been shown in the previous rearrangements that such a fraction consists of thymol and the para substituted isomer, *p*-isopropyl-*m*-methylphenol. The product was alkali soluble and ferric chloride colored its alcohol solution;  $n_D^{22}$  1.5274. The yield of redistilled product was 65%. There was no unrearranged ether and no *m*-cresol.

CONTRIBUTION FROM THE  
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RECEIVED OCTOBER 13, 1932  
PUBLISHED FEBRUARY 9, 1933

(1) Niederl and Natelson, *THIS JOURNAL*, **53**, 1928 (1931); **54**, 1063 (1932); Niederl, Natelson and Smith, Indianapolis Meeting of the American Chemical Society, 1931; Sowa, Nieuwland and Hinton, *THIS JOURNAL*, **54**, 2019 (1932).