

ELECTROLYTIC HYDROGENATION OF CRESOLS

BANCROFT and George¹ have shown that the hydrogenation of phenol at a platinised-platinum cathode is not an electrolytic process and is probably the result of oriented adsorption of the phenol molecule, the platinised-platinum acting as a source of hydrogen. It was thought that a study of the hydrogenation of the three isomeric cresols under the same conditions would throw greater light on the mechanism of hydrogenation at the cathode, besides revealing the influence of substitution on the process of hydrogenation. The results obtained in the course of the study not only supports the view of the authors referred to above but also shows that the extent of hydrogenation is different in the case of each cresol as could be seen from the results given below:

<i>o</i> -Cresol	<i>m</i> -Cresol	<i>p</i> -Cresol
33.5%	41%	24.3%

(1/20 gm. mol. of each cresol was hydrogenated in a porous pot in 22 per cent. sulphuric acid with vigorous stirring, the C.D. being 4 amps./dm.² The theoretical quantity of current, 6 F./mol. was passed in each case.)

The maximum yield of hydrogenated product is obtained with *m*-cresol. The variation is due evidently to the influence of the position of the methyl group on the oriented adsorption of the cresol molecule on the electrode surface.

The hydrogenated product was found to be a mixture of methyl cyclohexanol and the corresponding methyl cyclohexanone. Analysis by Bennett and Donovan's hydroxylamine method² showed the product in each case to contain the proportions of ketone indicated below:

	<i>o</i> -Cresol	<i>m</i> -Cresol	<i>p</i> -Cresol
Ketone %	32.8	50.0	30

An entirely different effect was noticed when a cathode consisting of a mixed deposit of platinum and palladium in equal proportions was employed. The results are summarised below:

	<i>o</i> -Cresol	<i>m</i> -Cresol	<i>p</i> -Cresol
Total yield of hydrogenated product	25%	32.9%	43%
Ketone%	55%	80.1%	62.7%

Vavon and Berton³ have reported the formation of ketones during the hydrogenation of cresols in the liquid phase using platinum

black catalyst. The hydrogenation at the platinised-platinum cathode is exactly similar. It is, therefore, to be concluded that the hydrogenation is purely catalytic, and not electrochemical.

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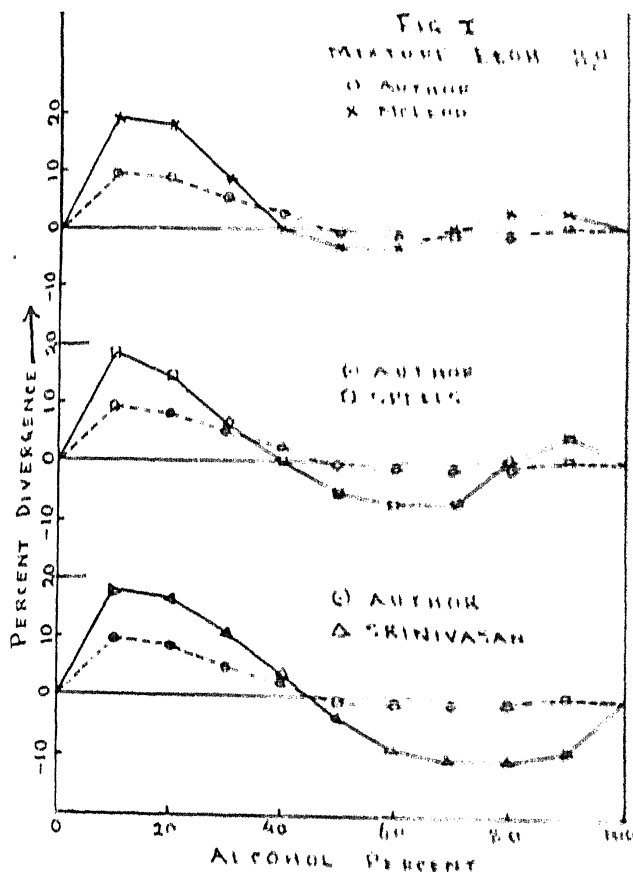
1. Bancroft, W. D., and George, A. B., *Trans. Amer. Electrochem. Soc.*, 1930, **57**, 39. 2. Bennett, A. H., and Donovan, F. K., *Analyst*, 1932, **47**, 146. 3. Vavon, G., and Berton, A. L., *Bull. So. Chim.*, 1925, (4) **37**, 294.

AN EQUATION FOR THE VISCOSITY OF NON-IDEAL LIQUID MIXTURES

An equation developed on the basis of Newton Friend's¹ Rheochor, in which account has been taken of the change in density occurring on mixing two liquids, is found to represent satisfactorily the viscosity variation of non-ideal liquid mixtures with their composition. This may be stated as:

$$\eta^{\frac{1}{2}} = \left(\eta_1^{\frac{1}{2}} \cdot \frac{M_1}{\rho_1} \cdot x + \eta_2^{\frac{1}{2}} \cdot \frac{M_2}{\rho_2} (1-x) \right) \left(\frac{\rho}{M_1 x + M_2 (1-x)} \right) \left(\frac{\rho_1 + x\rho_2}{\rho_1 + (1-x)\rho} \right)^m$$

where η , ρ denote viscosity and density of mixture; η_1 , ρ_1 and η_2 , ρ_2 the same quantities for



the two components and M_1 , M_2 their molecular weights; x the weight fraction of the first component; m an arbitrary constant.