

due to 5000 volts (r.m.s.) at two initial pressures. They are remarkably similar to the familiar concentration-time curves characteristic of the intermediate compounds in consecutive reactions. This, together with a general finding in these Laboratories that admixture even in traces of a component with a large 'electron affinity' increases V_m , suggested the intermediate occurrence of nitrogen peroxide in the decomposition of nitric oxide under the discharge. Later, this deduction was fully confirmed by direct optical and analytical examination of the decomposition mixture at the intermediate stages of the reaction. This examination entails on the one hand, an accessory and by no means simple manipulation, and is liable on the other, to disturb the chemical state of the mixture. Such limitations are, however, absent in the threshold potential determinations, which can be carried out with the reaction mixture *in situ*, whilst giving an adequate indication of the occurrence of any intermediate reaction, and are of general applicability.²

Further work has shown that the threshold potential measurements are markedly sensitive to change, when a discharge reaction is produced under an *additional* constraint, such as irradiation, a magnetic field, an altered temperature or frequency of the A.C. supply. Moreover, even in such quasi-chemical changes, as the induction of the 'latent image' on a photographic plate, activation of nitrogen, its deactivation, or spectral shift in the 'after glow', V_m has been found to be the chief determinant of both their inception and time rate.

S. S. JOSHI.

Department of Chemistry,
Benares Hindu University,
Benares,
November 8, 1939.

¹ Joshi, *Trans. Farad. Soc.*, 1927, **23**, 227; 1929, **25**, 108, 138, 143.

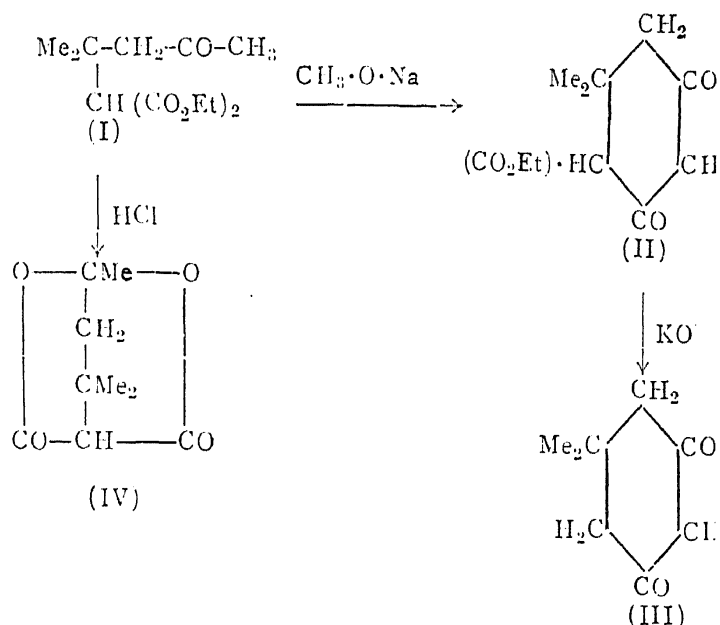
² ———, *loc. cit.*, 1929, **25**, 120.

³ Warburg, *Ann. Physik*, 1909, **28**, 1-17; Lunt, *Phil. Mag.*, 1925, **49**, 1238.

Reformatsky Reaction with Ethyl Bromomalonate and Acetone

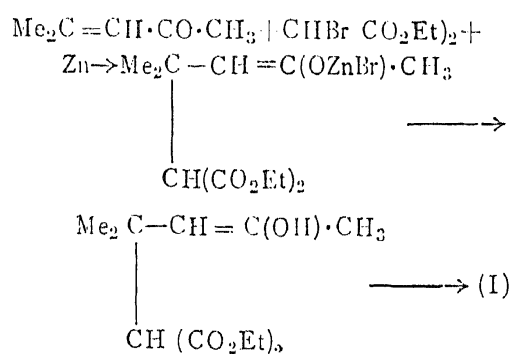
THE classical Reformatsky Reaction,^{1,2} for the synthesis of β -hydroxy esters has been studied by several workers with α -halogen esters of various monocarboxylic acids on ketones or oxides. The study of this reaction is now being pursued with α -halogen esters of dicarboxylic acids.

Instead of giving the expected β -hydroxy ester, the condensation of ethyl bromomalonate with acetone in presence of zinc, follows an unexpected course where one molecule of the ester reacts with two molecules of the ketone leading to the formation of ethyl acetyl-iso-propyl-malonate (I), b.p. 125-137°/4 mm. (semicarbazone m.p. 74-75°). The results of analysis, the molecular weight determination and its cyclisation with sodium methylate to Vorländer's ester³ (II)—not isolated—with subsequent hydrolysis to 5:5-dimethyldihydro-resorcin⁴ (III) definitely establishes the identity of (I). On hydrolysis with hydrochloric acid, ester (I) gives the dilactone (IV) m.p. 135-136°.



Qudrat-i-khuda⁵ has prepared (II) and (IV) from 6-hydroxy-2-keto-3-cyano-4:4:6-trimethylpiperidine obtained by the condensation of mesityl oxide with cyanacetamide. A comparison of the present products with those of Qudrat-i-khuda also confirmed their identity. The mechanism of the reaction is explained

as follows. First of all two molecules of acetone condense to form mesityl oxide. Afterwards, in analogy with the observations of Kohler *et al.*,⁶ the zinc compound of ethyl bromomalonate adds on to it in 1:4-positions leading to the formation of (I) as under.



The full paper will be published elsewhere.

BALKRISHNA H. IYER.

Department of Pure and Applied Chemistry,
Indian Institute of Science,
Bangalore,
December 10, 1939.

¹ Reformatsky, *J.R.C.S.*, 1890, **22**, 49; *British Chemical Abstracts*, 1891, **60**, 169.

² W. H. Perkin, *J.C.S.*, 1896, **69**, 1482.

³ Vorländer, *Annalen*, 1897, **294**, 300.

⁴ —, and Erig, *Ibid.*, 1897, **294**, 314.

⁵ Qudrat-i-khuda, *J.C.S.*, 1929, 201.

⁶ Kohler, Heritage and Macleod, *Amer. Chem. J.*, 1911, **46**, 217.

Magnetic Susceptibilities of Some Fluorides

THE susceptibilities of fluorides of Li, Na, S, K, Ca, Mn, Co, Ni, Ge, Se, Rb, Sr, Mo, Te, Cs, Ba, W, Tl, Pb, U, Ce and Nd have been already studied by various investigators.^{1,2}

Susceptibilities of fluorides of Mg, Al, Cd, Cr, Fe, Cu, Zn, Ce, Hg, Bi and fluoride of KBe have now been determined by me using the usual Gouy method.

The electromagnet was constructed in our laboratory. It gives a maximum field of 13,000 Gauss at 22 Amp. and 110 volts with an air gap of 1.0 cm. All the salts except MgF_2 (Kahlbaum, Berlin), KBeF_2 and FeF_3 (Chemische Fabric, Gorlitz), were prepared by British Drug House, London. They were packed in thin glass tubes

and the mass susceptibilities were calculated by the usual formula,

$$F_{\text{A}} = \frac{1}{2}A(K_1 - K_2)(H_1^2 - H_2^2)$$

where A is the area of cross-section of the specimen, F_{A} is the magnitude of the force on the specimen, K_1 and K_2 the volume susceptibilities of the specimen and the medium respectively, and H_1 and H_2 the fields at the lower and upper ends of the specimen. (Volume Susceptibility = Density \times Mass Susceptibility.)

The results after applying various corrections are as follows:—

Salt	Temperature	Mass Susceptibility $\times 10^6$
	°C.	
MgF_2	.. 28.0	+ 0.40
AlF_3	.. 29.2	-- 0.16
CdF_2	.. 29.0	-- 0.25
CrF_3	.. 32.0	+ 91.20
FeF_3	.. 32.0	+ 122.00
CuF_2	.. 32.2	+ 23.00
ZnF_2	.. 26.6	-- 0.37
CeF_3	.. 29.0	+ 10.90
		(standard value ³ = 11.10 at 20° C.)
BiF_3	.. 29.8	-- 0.23
HgF_2 (oxy)	.. 29.0	-- 0.26
HgF_2 (ous)	.. 29.0	-- 0.24
KBeF_2	.. 28.6	-- 0.60

Detailed account will be published elsewhere.

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ABDUL AWWAL CHOWDHURY.

Physical Laboratories,

Muslim University,

Aligarh,

November 30, 1939.

¹ *A.T.C.*, Paris, 1937, **8**, 23—2.

Ibid., 1937, **17**, 23—6.

² Landolt's Bornstein, *Tables of Constants*, Springer, Berlin, 1923, **2**, 1198; 1936, **3**, 2180.

³ —, *Ibid.*, 1936, **3**, 2181.