CXXV.—*The Basicity of Periodic Acid.*

By NORMAN RAE.

CRYSTALS of periodic acid have the formula H_5IO_6, *i.e.*, $HIO_4,2H_2O$; on the other hand, in addition to the metaperiodates MIO_4 (M being a univalent metal), complex salts of the types $M_4I_2O_9$, M_3IO_5, $M_8I_2O_{11}$, M_5IO_6, and $M_{12}I_2O_{13}$ have been described. There is therefore some doubt as to the real basicity of the acid. Ostwald (*J. pr. Chem.*, 1885, **32**, 300), from consideration of the conductivity of its solutions, concluded that it was polybasic, and Walden (*Z. physikal. Chem.*, 1888, **2**, 65), from the conductivity of monosodium periodate, considered this to be a salt of a monobasic acid. Rosenheim and Liebknecht, in view of the stability of the penta-argentic periodate (*Annalen*, 1899, **308**, 40), think the acid is normally pentabasic but is converted by strong alkalis into normal salts of the monobasic acid. Giolotti found the acid to be monobasic towards sodium hydroxide with methyl-orange as indicator (*Gazzetta*, 1902, **32**, 340) but dibasic when titrated potentiometrically (*Atti R. Accad. Lincei*, 1905, **14**, 217). Finally, Dubrisay (*Compt. rend.*, 1913, **157**, 1150) concluded that the acid is tribasic from its behaviour upon neutralisation.

The titration has now been carried out conductometrically and shows the acid to be dibasic; ionisation in the first stage is that of a strong acid (Landolt–Börnstein give a single figure, $K = 2{\cdot}3 \times 10^{-2}$, which is probably correct for the first stage), and in the second stage that of a weak acid (perhaps of the order of $K = 10^{-6}$).

EXPERIMENTAL.

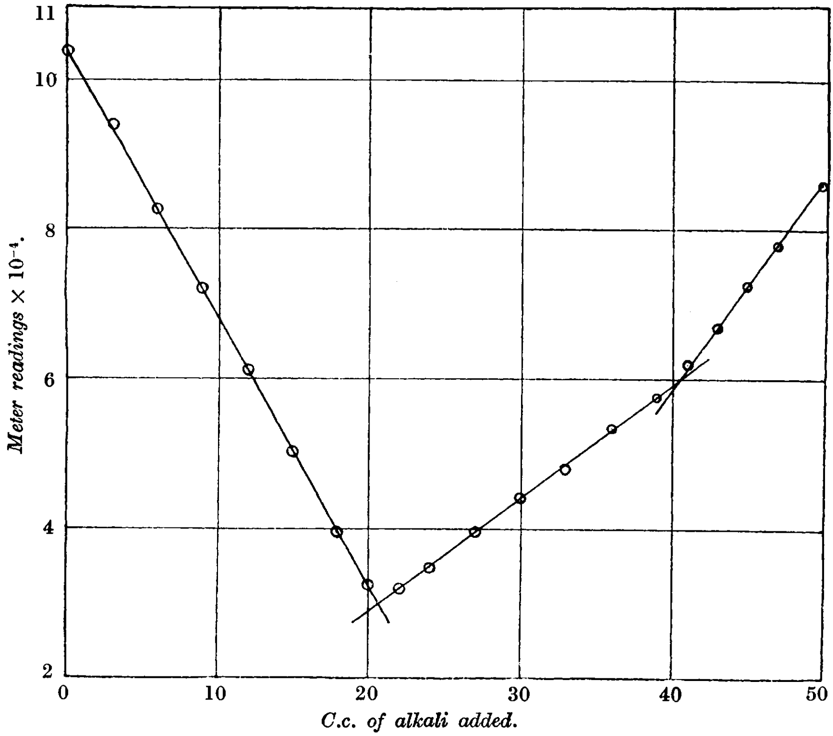
The crystals of the dry acid were weighed out and made up to a solution which was 0·09752*M* calculated as H_5IO_6 at 29°. This solution was then titrated by a conductometric method (the conductivity meter used will be described later). One titration of 20 c.c. of the acid with 0·09501*N*-sodium hydroxide is given as an example :

Alkali, c.c.	Meter reading.	Alkali, c.c.	Meter reading.	Alkali, c.c.	Meter reading.
0	105,500	20	32,700	39	57,800
3	94,000	22	32,200	41	62,000
6	82,500	24	35,000	43	67,000
9	72,000	27	39,700	45	72,500
12	61,000	30	44,200	47	78,000
15	50,200	33	48,200	50	86,000
18	39,700	36	53,500		

These figures when plotted (see diagram) give two distinct end-points; one at 20·6 c.c. and the second at 40·5 c.c. The former figure would show the solution to be 0·0979*M*, and the latter as

0·0962*M*. The mean of three determinations of the first point gave 0·0980*M*, and of two of the second point, 0·0963*M*.

In the data given above, the excess of alkali was only 10 c.c., so a third point would not have been indicated even if present. A trial was therefore made in which 10 c.c. of the acid were titrated



with a total amount of 50 c.c. of alkali. The readings by steps of 2 c.c. of alkali up to 40 c.c. were :

55,500	32,800	18,900	28,300	43,200	61,500	79,000
47,800	25,000	22,500	32,500	49,500	67,200	84,500
40,200	17,500	25,500	37,700	55,500	73,500	90,500

and with 50 c.c. 120,000.

These figures when plotted show the first two end-points at 10·3 and 20·3 c.c.; but from 20·3 c.c. to 50 c.c. the curve is a straight line with no indication of a break. The conductometric titration thus shows periodic acid to be dibasic.

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