Reaction of Potassium Chromate with an Indium Salt

By M. F. Stubbs[1]

The yellow precipitate formed by adding a chromate to a solution of an indium salt first described by Winkler[2] has been assumed to be indium chromate,[3] although Friend[4] points out that indium chromate does not appear to have been analyzed. In view of the present availability of indium, we have now carried out this precipitation and have made observations on the resulting changes in the *p*H of the solution.

Pure indium sulfate was prepared by the method of Seward[5] using 99.98% pure indium[6] and other reagents of analytical reagent quality. To the indium sulfate at 0.02 *M* concentration having an initial *p*H of approximately 2.5 as measured with a Model No. 3 *p*H Electrometer (Coleman), calibrated against the buffer solution furnished by the manufacturer, standard 0.2222 *M* potassium chromate solution was added at room temperature in small amounts from a buret with stirring.

A definite yellow turbidity appeared at *p*H 3.30, complete flocculation of the yellow precipitate taking place at 3.36–3.42, further additions of the chromate resulting in a steady rise in the *p*H. A typical titration curve is shown in Fig. 1. The results are in agreement with the observation of Moeller[7] that attempts to bring a simple indium salt to the neutral point result in the precipitation of hydrous indium hydroxide at *p*H 3.41–3.43.

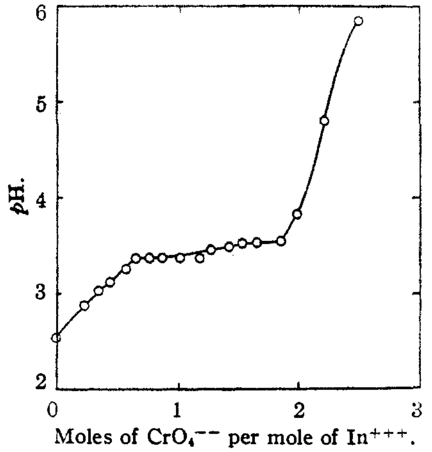

Fig. 1.

The yellow precipitate was then filtered and washed repeatedly until free of chromate. Prolonged washing, however, failed to remove the yellow color. After drying overnight at 110° to convert any hydrous indium hydroxide to indium hydroxide,[8] the precipitate was analyzed for indium by dissolving in dilute sulfuric acid and precipitating with ammonium hydroxide. This process was repeated and the indium hydroxide ignited to oxide. The combined filtrate was analyzed for chromium by acidifying with sulfuric acid, adding excess ferrous ammonium sulfate and back-titrating with standard potassium dichromate in the presence of phosphate ion with diphenylamine sodium sulfonate as indicator.

Anal. Calcd. for $In_2(CrO_4)_3$: In, 39.74; Cr, 27 02. Calcd. for $In(OH)_3$: In, 69.23. Found: In, 63.74, 63.55, 63.48; Cr, 2.16, 2.87, 2.94.

These observations indicate either that the precipitate originally formed is a mixture of indium hydroxide with indium chromate (or a basic indium chromate), or that the indium chromate as precipitated is very largely hydrolyzed during the washing process.

Department of Chemistry
Carthage College
Carthage, Illinois
Received November 12, 1943

---

[1] Present address: Tennessee Polytechnic Institute, Cookeville, Tennessee.

[2] Winkler, *J. prakt. Chem.*, **102**, 289 (1867).

[3] J. W. Mellor, "A Comprehensive Treatise on Inorganic and Theoretical Chemistry," Vol. 5, Longmans, Green and Co., 1924, p. 395.

[4] Friend, "Textbook of Inorganic Chemistry," Vol. 4, Chas. Griffin and Co., Ltd., 1917, p. 162.

[5] Seward, This Journal, **55**, 2740 (1933).

[6] From the Indium Corporation of America, Utica, New York.

[7] Moeller, This Journal, **63**, 2626 (1941).

[8] Carnelley and Walker, *Trans. Chem. Soc.*, **53**, 74 (1888).

The Viscosities of Dimethyl and Trimethylamine at 15, 25 and 35°

By Elijah Swift, Jr., and Dexter Leigh Wolfe[1]

The viscosities of dimethyl- and trimethylamine have been measured at three different temperatures using benzene as a standard.

Procedure.—A sample of the amine purified as previously described[2] was distilled into a viscometer under reduced pressure and measured under the pressure of its vapor. Benzene dried over sodium was distilled directly from the sodium into the apparatus. The values for its density and viscosity were taken from the "International Critical Tables."

An all-glass viscometer of the Ostwald type was used, its design being such that the Reynolds number was well below the critical value, and the surface tension correction[3] was minimized. The viscometer was sealed during measurements, so the upper bulb was filled by inverting the instrument beneath the surface of the water in the thermostat. It was not possible to get the same volume each time, so a correction was made for the working volume,[2] as calculated from the weight of material in the instrument and its density[1] at each temperature. At least three measurements of the time of efflux were made at each temperature, using a stop watch calibrated against a standard clock. The temperature was controlled[1] to ±0.02°. Two fillings with different material were made with each compound and with benzene.

The average difference in time between the two runs made on a liquid at the same temperature was 0.2% and the greatest difference 0.5%. The equation used to calculate the viscosities was

$$\eta = \eta_0 \frac{dt}{d_0 t_0} + \frac{mV}{8\pi l} \frac{d}{t} \left(\frac{t^2}{t_0^2} - 1\right)$$

where the symbols have the usual meanings. The value of *m* was taken as 1.12,[4] the correction

---

[1] At present with the Armed Forces.

[2] E. Swift, Jr., This Journal, **64**, 115 (1942).

[3] G. Jones and J. H. Fornwalt, *ibid.*, **60**, 1683 (1938).

[4] E. C. Bingham, "Fluidity and Plasticity," McGraw-Hill Book Co., New York, N. Y., 1922. E. Hatschek, "Viscosity of Liquids," D. Van Nostrand, Co., New York, N. Y., 1928.