V.—*The Solubility of Sodium Iodide in Ethyl Alcohol.*

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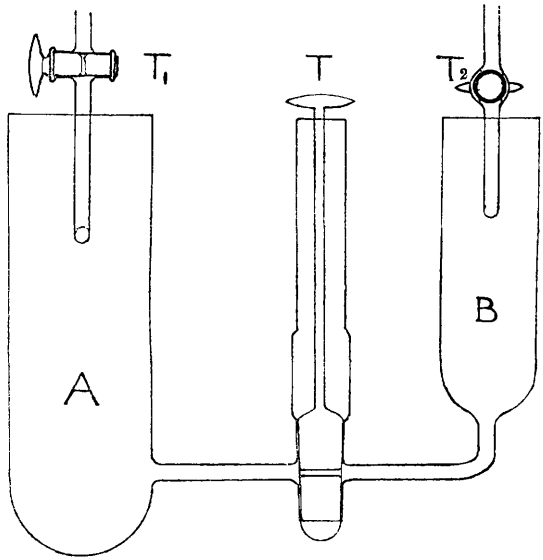
The solubilities of the iodides of the alkali metals in alcohol require reinvestigation on account of the probable presence of moisture in the materials previously employed.

Preparation of the Materials.—Ethyl alcohol. Two litres of 96% alcohol were poured on to freshly burnt quicklime, refluxed for 6 hours, distilled, and refluxed over a further quantity of lime. The alcohol was distilled on to 5 g. of powdered silver nitrate previously dried at 110°, refluxed, and distilled. The distillate was refluxed with about 20 g. of fresh calcium turnings and distilled through a tall column, the first and last fractions of 100 c.c. being rejected. The alcohol was stored in a vessel with a siphon attachment and a guard tube of phosphorus pentoxide. The alcohol was free from aldehyde, ketone, ethyl nitrite, and ammonia. The density ($D_4^{25°}$) was 0·7851.

Sodium iodide. The iodide was prepared by decomposing pure sodium carbonate with hydriodic acid of constant b. p. (126°), prepared by the action of hydrogen sulphide on iodine in the presence of water. The solution of sodium iodide, slightly coloured with iodine from the decomposition of a little of the acid by the air, was evaporated to dryness and the solid recrystallised three times from water. The crystals of $NaI,2H_2O$ were heated in a large porcelain boat in a sloping glass tube through which a slow current of pure dry hydrogen was passing. The electrolytic hydrogen used in these

experiments was contained in a cylinder and was freed from oxygen by passing over heated platinised asbestos. As the water was driven off from the iodide the temperature was increased to 120°. The white solid was cooled in dry hydrogen, removed quickly, and ground up in a mortar contained in a desiccator over phosphorus pentoxide (Parker, J., 1914, **105**, 1504). Spectrum analysis failed to reveal the presence of other metals and the iodine content was shown to be 84·64% by precipitation as silver iodide (Theory, 84·66%).

FIG. 1.



Experimental.—On account of the hygroscopic nature of the solution the apparatus shown in Fig. 1 was devised. The apparatus was carefully dried and an excess of sodium iodide, together with the alcohol, placed in the tube A. The tube was closed with a good cork, which had been dried by heating in a wax-bath at 120°, and fitted with a glass stirrer. The air in the tube was displaced by dry hydrogen through the tap, T_1, and the vessel was then closed by pouring mercury into the seal surrounding the stirrer. Tube B was closed with a rubber bung, through which passed a filter tube packed with dry cotton wool, reaching to the bottom of B, with the top ground to take the end of a standard pipette. The capacity of A was approximately 80 c.c. and that of B 30 c.c. Tube B was filled with dry hydrogen and closed at the top of the filter tube with pressure tubing and a clip. Connexion between A and B could be made through the enclosed tap, T.

The apparatus was placed in a thermostat maintained at 25·0°, and the alcohol and iodide were stirred over-night. The stirring was then discontinued, and a sample of the saturated solution of iodide transferred to B through T by suction through T_2, dry hydrogen being admitted through T_1 to take the place of the solution removed. Quantities of approximately 10 c.c. of the solution were removed in standard pipettes and rapidly transferred to weighed evaporating flasks fitted with ground glass stoppers having two tubes sealed into them, the outer ends being provided with ground glass caps. The weights of the solutions were found, the solutions evaporated to dryness, the residues heated to 120° in a stream of dry hydrogen, and weighed. The solubility of sodium iodide in alcohol at 25° was found and an approximate value for the density of the solution as compared with water as a standard was calculated.

Results.—The figures under $S^{25°}$ represent the solubilities of sodium iodide in ethyl alcohol at 25° in g. per 100 g. of alcohol.

Expt. ...	1	2	3	4	5	6	7	8	9	10
$S^{25°}$	42·82	42·39	42·20	42·13	42·89	42·83	42·84	42·24	42·50	42·89

Density ($D_{4°}^{25°}$) = 1·037. Mean value of $S^{25°}$ = 42·57.

Pure dry lithium iodide has been prepared by heating the monohydrate in a current of dry nitrogen free from oxygen, and investigations on the influence of the solubility of lithium iodide on the solubility of sodium iodide in alcohol are in progress.

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