Specific Conductance of Concentrated Ammonium Nitrate Solutions

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THE SPECIFIC CONDUCTANCES of ammonium nitrate solutions have been catalogued in the International Critical Tables (*9*) prior to 1929, and by Scatchard and Prentiss (*11*) in 1932. Since then, only Campbell and collaborators (*1-6*) seem to have measured the specific conductivity of ammonium nitrate solutions and this, over a wide range of concentrations, from very dilute to the fused salt.

Table I. Specific Conductance of NH_4NO_3 Solutions at High Concentrations

Concn. % by Weight	Temp., °C.	Specific Conductance $(Ohms\text{-}Cm.)^{-1}$
64	49	0.463
64	66	0.525
64	82	0.576
72	49	0.401
72	66	0.466
72	82	0.518
76	49	0.365
80	66	0.369
80	82	0.424

In a project sponsored by the Foxboro Co., some values of the specific conductance of ammonium nitrate solutions at high concentrations, not already reported in the literature, were determined.

EXPERIMENTAL

Ammonium nitrate was obtained from the Consolidated Mining and Smelting Co. and was used without further purification. The determination of nonvolatile impurities showed less than 0.03% nonvolatiles. Then, it was estimated that the salt was sufficiently pure. Also, the salt was dried at 80° C. for 24 hours prior to preparing the solutions.

Measurements were made in a Jones-type conductivity cell calibrated for each experimental temperature with a 0.1000*N* KCl solution. The constant of the cell was determined for each temperature, and the specific conductances for 0.1*N* KCl solution at these temperatures were calculated from the equation of Bouty (*10*). The cell was filled with solutions at a much higher temperature than that necessary for the experiment, after which it was placed in an oil bath (*7, 8*) maintained at ± 0.1° C. of the required temperature. This was done to prevent crystallization inside the cell. When the thermometer in the nitrate solution had reached the desired temperature, conductivity measurements were made by determining the cell resistance with a modified impedance K.L.B. bridge. The internal oscillator and the magic eye of the bridge were replaced by an external oscillator and an oscilloscope. The frequency used for the measurements was 1000 c.p.s.

RESULTS

Based on the precision of the instruments utilized, the accuracy obtained in the determination of specific conductance of ammonium nitrate solutions is ±0.1% of the values shown in Table I.

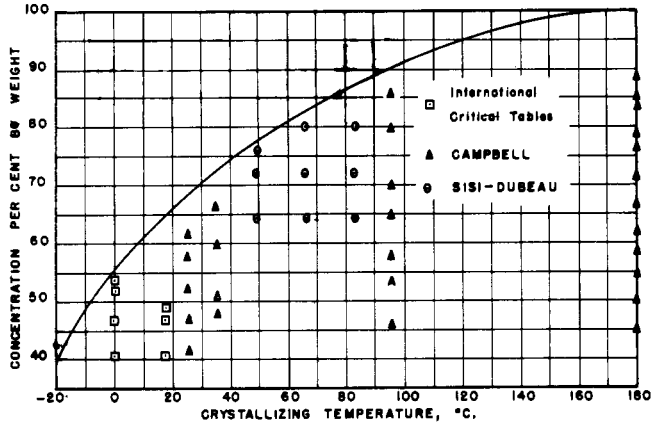

Figure 1. Relation of concentration and crystallizing temperature of ammonium nitrate solutions

Figure 1 shows the concentration at which the specific conductances were determined. It also shows that these measurements covered an area not already studied.

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