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Solid-Liquid Phase Equilibria in the Sodium-Rubidium Alloy System

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Thermal methods were used to determine with high precision, the solid-liquid phase equilibria gram for the sodium-rubidium system. The results differ greatly from those of earlier workers, cially near the eutectic composition where differences in melting points as large as 25 K occur. search was made for possible intermetallic compounds (especially Na_2Rb). Neither slow tempera- cycling in the temperature range where compound formation could occur nor extended periods annealing just above the eutectic temperature produced any evidence for compound formation. 1 (sodium to rubidium) sample was subjected to 60,000 atm pressure. Again, no evidence was ined for solid compound formation.

Freezing point measurements have been made by several workers [1-3] on solutions sodium and rubidium in an attempt to determine the solid-liquid phase diagram this system. The measurements were made without the advantage of high purity tals, platinum resistance thermometry, and modern inert atmosphere facilities. As result, the data are in poor agreement, especially on the rubidium-rich side of the fectic, where few data points were obtained. Comparison of the data available dicated differences in temperature of as much as 15° between the data of Rinck [1] and di of Goria.[2] No evidence was found in any of the previous work for intermetallic mpound formation. This seemed surprising since a peritectically melting Na_2K rmetallic compound had been well established in the sodium-potassium system,[4,5] d a sluggishly forming peritectically melting Na_2Cs compound had been reported the sodium-caesium system.[6,7]

As a part of our investigation of alkali metal mixtures, we sought to obtain a tailed and accurate solid-liquid phase diagram for this system. Of special interest as the possibility for the formation of intermetallic compounds such as Na_2Rb.

EXPERIMENTAL

CHEMICALS

High purity (99.8 % minimum) rubidium was obtained from the Kawecki Chemical pany. Batch analysis of the material by Kawecki Chemical indicated 0.034 mol % Cs, mol % K, 0.018 mol % Na, 0.015 mol % Si with negligible amounts of other ities. Oxygen analysis was not available. However, calculations from the change in g point with fraction melted indicated less than 0.02 mol % oxygen. The rubidium sidered to be better than 99.9 % pure.

tor Grade sodium was obtained from the U.S. Industrial Chemical Company. ations for Reactor Grade sodium limit the impurities to <200 p.p.m. K, <100 p.p.m. <50 p.p.m. Rb and smaller amounts of other impurities. Comparison of the point of this sodium with our measurements of an ultra-pure sample as described literature [5] limits the impurities to <0.05 mol % total.