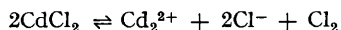


A Fused Salt Solvent for growing Cadmium Sulphide Crystals

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CADMIUM sulphide crystals have been grown by the vapour-phase method.¹⁻³ While cadmium chloride was found to be a suitable solvent for cadmium sulphide it was thermally unstable.⁴



The addition of sodium chloride stabilized the

system. We now report that crystals of cadmium sulphide may be grown from the fused salt, cadmium chloride-sodium chloride. From the phase diagram of cadmium chloride-sodium chloride,⁵ solubility curves of cadmium sulphide from four regions of the phase diagram were determined in order to obtain the optimum

¹ R. Frerichs, *Phys. Rev.*, 1947, **72**, 594.

² L. C. Green, D. C. Reynolds, S. J. Czuzak, and W. M. Baker, *J. Chem. Phys.*, 1958, **29**, 1375.

³ R. J. Miller and C. H. Bachman, *J. Appl. Phys.*, 1958, **29**, 1277.

⁴ K. Grhotheim, F. Gronvold, and J. J. Krogh-Moe, *J. Amer. Chem. Soc.*, 1955, **77**, 5824.

⁵ *Internat. Critical Tables*, 1937, **4**, 55.

composition of the solvent. The four compositions used were: 30-70, 45-55, 50-50 and 70-30 mole percent. of sodium chloride-cadmium chloride. Since the cadmium sulphide did not self-seed on cooling, and to prevent the cadmium or sodium chlorides from seeding the solution, a crystal of cadmium sulphide was added to the solution every 15° on cooling. The crystals of cadmium sulphide used in the seeding process were prepared by heating a mixture of fused solvent with cadmium sulphide. On cooling, this solid was leached with water to dissolve the fused solvent. The Figure shows the solubility curves obtained for cadmium sulphide in the various cadmium chloride-sodium chloride mixtures. The slopes of the solubility curves are zero when cadmium sulphide is not the only substance present. The 50% sodium chloride-50% cadmium chloride mixture (Curve III) gave the best linear solubility curve over a large temperature range.

A typical growing process involved the charging of a platinum crucible with 4.3 weight percent. of stock cadmium sulphide and 50% sodium chloride-50% cadmium chloride. The mixture was heated to 650° and stirred to dissolve the solute. On cooling, several seeds of cadmium sulphide were placed on top of the cake, the cake was reheated to 650° for three hours in a sand-bath and allowed to cool to 400° over a three-hour period. The mixture was then quickly cooled to room temperature in a stream of air to prevent surface growth on the cadmium sulphide as the melt cooled. Upon leaching the cake with water, light yellow plates having sharp corners, up to 0.7 mm. across

the hexagonal face and 0.01 mm. thick, were obtained. The hexagonal face varied from 70° to 90° with *c*-axis. Using the above procedure and doping the mixture with 0.1 weight percent. of silver chloride, dark red hexagonal plates approximately 0.03 mm. thick were obtained.

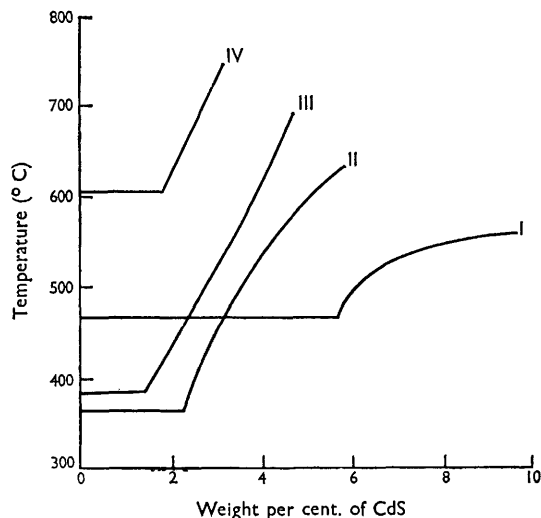


FIGURE. Solubility of CdS in various $CdCl_2$ -NaCl mixtures; Mole % NaCl; I-30%; II-45%; III-50%; IV-70%.

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