

The CdS sample was placed in the bomb between two NaCl wafers. The bomb was pressurized to approximately 38 kb, and lowered into liquid N_2 in a large styrofoam dewar. After the bomb temperature reached 77°K the pressure was released. The bomb was disassembled under liquid nitrogen and the resulting sample pellet removed. The pellet could be cleaved apart in the nitrogen bath and the CdS specimen removed.

The recovered sample was black in color with a shiny metallic-like luster similar to that reported by CORLL.⁽³⁾ When observed with transmitted light, the thinnest samples were quite transparent and red in color.

The absorption edge of the NaCl structure was measured with a Cary model 14 photospectrometer, and is compared with that of pure CdS wurtzite structure platelet in Fig. 1. The NaCl

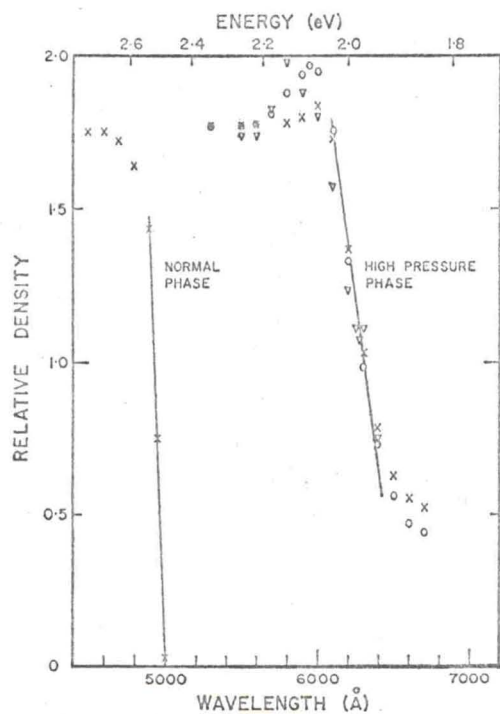


FIG. 1. Absorption edge of wurtzite and NaCl structures in CdS at 77°K.

structure is labeled "high pressure phase". Visual inspection of the NaCl structure showed relatively large regions which were transparent, indicating

single crystal structure, while other areas were translucent to the transmitted light.

The annealing temperature of the NaCl structure to zincblende phase was measured optically with the Cary photospectrometer. The sample was placed in a copper holder which had a Rosemont type 118G platinum resistance thermometer soldered to it. The holder was placed in a quartz dewar and the sample was warmed at a slow rate. 6600 Å light was shone through the crystal and the optical density vs. temperature was recorded. The sample in the zincblende phase is a fine powder due to the large volume expansion associated with the transformation,^(2,4) and is optically dense. The transformation was evident by the increase in density. The results for 2.5 and 4.0 mil samples are shown in Fig. 2. A 36 mil-thick sample was transformed at a temperature of $150 \pm 5^\circ\text{K}$.

The annealing of the zincblende to wurtzite phase took place in less than $\frac{1}{2}$ hour at 375°. At higher temperatures, the transformation takes place in seconds.

Laue back reflection X-ray studies on the high pressure phase showed that when the starting crystal was 36 mil thick, the recovered sample was a powder. Crystal thicknesses of 4.0 to 10.0 mil yielded poly-crystalline samples, and crystal thicknesses of 4.0 mil or less yielded large regions of single crystal NaCl structure.

3. DISCUSSION

In the absorption edge measurements (Fig. 1) the NaCl structure crystal was so thin, i.e. approximately 2.5 mil thick, that it was necessary to leave the crystal on one-half of the salt pellet. The scattering of the data points at the high density end of the edge is due to the crystal-salt interface. Using the previously reported value of 4850 Å at 77°K for the absorption edge of the CdS wurtzite structure platelet, the corresponding density on the NaCl structure crystal gives $E_g = 2.04 \pm 0.02$ eV. This value is not in agreement with previously reported values of 1.3 eV by SAMARA and GIARDINI⁽⁴⁾ and of 1.7 eV by EDWARDS, SLYKHOUSE and DRICKAMER.⁽¹⁾ Edwards, Slykhouse and Drickamer measured the shift of the absorption edge to determine $E_g = 1.7$ eV for the band gap. They stated that the transformation at approximately 27.5 kb "resulted in a loss of most of the light available, and in only two runs" were

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