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THE EFFECT OF HIGH PRESSURE ON THE LATTICE PARAMETERS OF INDIUM AND ITS ALLOYS*

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Abstract—The effect of pressure to several hundred kbars has been measured on the lattice parameters of indium of an indium-tin alloy, and of two indium-thallium alloys. All four systems crystallize in the face centered tetragonal structure. All showed a maximum in c/a in the region $V/V_0 = 0.88-0.84$. Pure indium and the thallium alloys behaved very much alike, while the tin alloy has a considerably lower maximum for $c/a/(c/a)_0$ at a lower V/V_0 .

THE EFFECT of pressure to several hundred kbars has been measured on the lattice parameters of indium, an indium-tin alloy and two indium-thallium alloys. The high pressure X-ray techniques used have been described elsewhere.⁽¹⁾

The indium used was purchased from A. D. Mackay Inc. of New York City and is listed as 99.99% pure. To prepare the sample material the indium ingot was filed, the powder produced sealed in a Pyrex tube under a vacuum and annealed for one week at 125°C. The tin and thallium used to prepare the alloys was obtained from Fisher Scientific Co. of Fair Lawn, New York. The alloys were prepared by weighing appropriate amounts of the metals, placing them in a graphite crucible with a small amount of flux, heating the assembly under an argon atmosphere in a Lepel induction furnace to a temperature approximately 30° above the fusing temperature and holding it there for 2 min, and finally allowing the assembly to cool and reweighing the metal to assure no loss of material. The alloy samples were annealed under a vacuum for 1-2 weeks, filed to a fine powder and again annealed for one week under a vacuum at 125°C.

Both indium and the alloys studied have a face centered tetragonal structure with c/a ratios in the range 1.05-1.09. The values of c and a were

obtained by averaging results from calculations from pairs of lines in the spectrum. The lines used were 111, 113, 311 at times the 002 and 200 and occasionally the 022. Figures 1-4 show typical data for indium and the indium-tin alloy. For pure indium there appears to be a slight irregularity in c and a near $V/V_0 = 0.95$. The magnitude is of the order of our experimental error but we have included it, as it appeared on essentially every run. Pressures were obtained by using a marker of known compressibility (Al, Ag, or MgO). The metal compressibilities were taken from shock wave work,⁽²⁾ the MgO data were from this

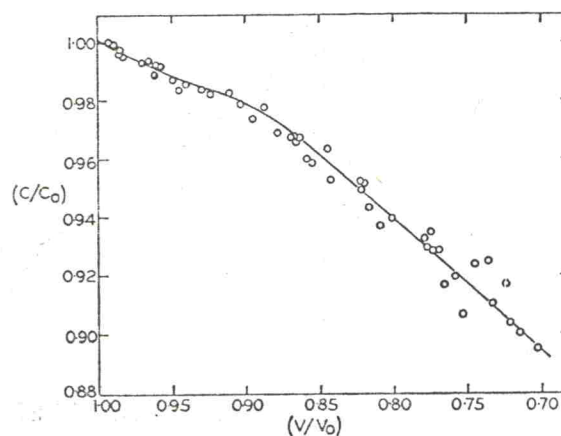


FIG. 1. c/c_0 vs. V/V_0 —Indium.

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