It is interesting to compare the corresponding work on the melting of germanium by Hall⁹. In this he finds a variation of melting point with pressure which is substantially linear over the range 0–180,000 atmospheres. When his value of the slope of the melting curve is used to calculate the latent heat of fusion, using a measured value¹⁰ of the volume change, a value of 84 cal./gm. is found which is in fair agreement with the experimentally determined value of 110 cal./gm.¹¹.

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Diffusion of Cadmium into Gallium Arsenide

DIFFUSION of cadmium-115 into gallium arsenide has been examined by a method identical to that described by us¹ in the case of zinc-65. The cadmium was diffused from a saturated vapour into a carefully prepared specimen of gallium arsenide approximately 1 cm. × 0.4 cm. × 0.2 cm. contained in a quartz tube 2 cm.³ in volume. After diffusion auto-radiographs of the specimen were taken to check the uniformity of activity across the surface and the diffusion profile was obtained by sectioning as described in the reference.

Fig. 1 shows typical diffusion profiles after diffusion for 40 hr. at 1,000° C. with the cadmium source held at 750° C.

The initial decrease in concentration from 2×10^{19} cm.⁻³ at the surface is very rapid. Fitting this part of the curve to a complementary error function, an approximate diffusion coefficient, D , of 3×10^{-12} cm.² sec.⁻¹ can be obtained. The concentration falls to a minimum, which is sometimes below the limit of detectability, but rises again to a maximum followed by a much more gradual decrease. Twelve different specimens have been examined and all have shown the same qualitative results. The half-life of the deeply penetrating activity has been measured and found to be the same as that of the irradiated cadmium, thus ruling out the possibility that the effect is due to an impurity in the cadmium. Although the steeply falling portion of the profile is reproducible, the concentration at the subsequent maximum has varied between 4×10^{18} cm.⁻³ and $\sim 10^{16}$ cm.⁻³ in a manner which is at present unaccountable.

Fig. 1. Cadmium concentration versus distance from surface. Diffusion temperature, 1,000° C.; diffusion time, 40 hr.; cadmium source temperature, 750° C.

Goldstein² has also examined the diffusion of cadmium into gallium arsenide and fits his results to simple complementary error functions. The value of D which he obtains for 1,000° C. is somewhat higher than that which we obtain from the steeply falling portion of our curves. He does not report any anomalies in his results such as we have found. However, it should be noted that his conditions of diffusion are somewhat different from ours, and in particular he has chosen to carry out diffusion in the presence of an arsenic atmosphere.

In an attempt to explain this behaviour experiments have been performed using:

- (1) crystals of different conductivity type;
- (2) crystals orientated so that diffusion along [111], [111], [110] or [100] directions was examined;
- (3) crystals strained to produce a large concentration of dislocations.

No correlation has been found between these crystal properties and the characteristics of the diffusion profile.

Further experiments to elucidate the mechanism of this diffusion are in progress.

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Fine Structure of the Nuclear Magnetic Resonance Spectra of Solids: Chemical Shift Structure of the Spectrum of Phosphorus Pentachloride

THE static dipolar interaction between the nuclei in a solid causes its nuclear magnetic resonance spectrum to be much broader than that of a liquid. In the liquid state the isotropic re-orientation and diffusion of the molecules average their nuclear dipolar interaction almost to zero, often revealing a