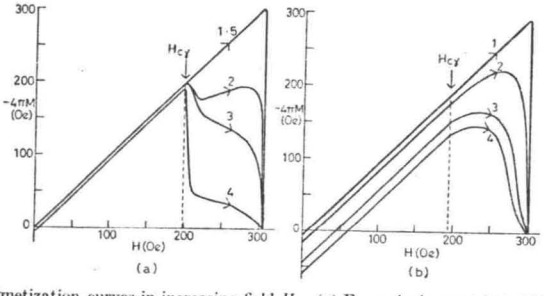
single crystal and a polycrystal of mean grain size 2 mm. Prior to recording each magnetization curve the magnetic field had been increased to a value greater than the critical field $H_{c\alpha}$ for the α phase and then had been reduced slowly to zero, leaving the specimens with some trapped flux. After obtaining the curves 1 to 4 of fig. 1 (*a*), which show the progressive effect of increasing deformation, the single crystal specimen was annealed for 12 hours at a temperature near 77°K after which the magnetization curve 5 taken at 2·11°K reverted to that for the pure α phase. Three other nearly single crystals were strained at liquid helium temperatures, two of which yielded magnetization curves similar to those of fig. 1 (*a*) but with less pronounced inflexion; the third yielded curves similar to those of fig. 1 (*b*) for a polycrystalline specimen. All sets of curves have the following features in common:

(i) The field at which $-4\pi M$ falls to zero remains approximately unchanged throughout the deformation and is the critical field $H_{c\alpha}$ of the α phase.

(ii) The field at which the magnetization first deviates from the perfect diamagnetic also remains unchanged throughout the deformation; this we identify as the critical field $H_{c\gamma}$ of the supposed γ phase.

Fig. 1

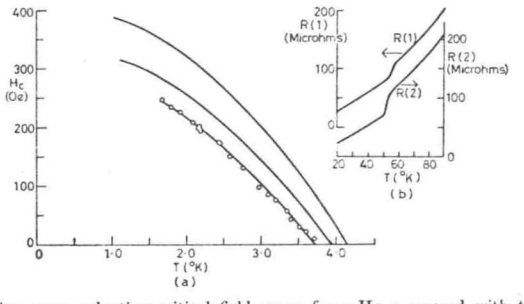


Magnetization curves in increasing field H. (*a*) For a single crystal at 2·11°K: curve 1, unstrained; 2, 2·8%; 3, 5·7%; 4, 13·3% strained at 2·11°K; curve 5, after anneal near 77°K; (*b*) for a polycrystal at 2·16°K: curve 1, unstrained; 2, 5·5%; 3, 11·1%; 4, 22·2% strained at 2·16°K.

The variety of shapes of the magnetization curves between the extremes of figs. 1 (*a*) and (*b*) is probably due to differences in orientation of the transformed regions relative to the specimen axis; there is some evidence from surface traces left on the rods that these regions are platelets, spanning the whole cross section in some of the monocrystalline specimens. In the

hypothetical case of a specimen split up into plates of α and γ phase parallel to the rod axis one would expect a linear superposition of two type I magnetizations, and curve 4 of fig. 1 (*a*) is the nearest approach to this case. For all other orientations of the plates the magnetization behaviour in the range of fields $H_{c\gamma}$ to $H_{c\alpha}$ will be complicated by the formation of the superconducting intermediate state and by the screening of γ regions by α regions.

Fig. 2



(*a*) The superconducting critical field curve for γ-Hg compared with those for α and β-Hg as determined by Schirber and Swenson (1961); (*b*) the resistances R(1) and R(2) of two specimens, previously strained about 30% at 4·2°K, as a function of increasing temperature showing the transformation back to α-Hg at about 53°K.

The critical field curve for the γ phase is shown in fig. 2 (*a*) together with those for α and β-Hg found by Schirber and Swenson (1961). Values of $H_{c\gamma}$ were found from feature (ii) above, as shown in fig. 1, from results on three specimens which had been strained about 30% at 4·2°K, and on three others which had been strained at a temperature below $T_{c\gamma}$. Extrapolation yields a value $T_{c\gamma} = 3{\cdot}74 \pm 0{\cdot}05$°K, compared with $T_{c\beta} = 3{\cdot}949$°K and $T_{c\alpha} = 4{\cdot}153$°K (Schirber and Swenson 1961).

The increase of resistance on warming up two typical specimens which had previously been strained about 30% at 4·2°K is shown in fig. 2 (*b*); the temperature, 53 ± 3°K, of the sharp increase is reproducible, and no further steps were observed up to 100°K. From this, and from curve 5 of fig. 1 (*a*), it can be concluded that the γ phase transforms directly back to the α phase. The magnitude of the step at about 53°K varies from one specimen to another, presumably according to the degree of transformation achieved. The magnetization measurements, such as are shown in fig. 1 (*a*) for a specimen of favourable crystallographic orientation, suggest that the fraction by volume of transformed material increases rapidly with strain up to about 5%