

experiments designed to provide data leading to an explanation of the phenomena.

3.4.4 Portions of the cored Pu-0.94 wt.-% Ga alloy, cold rolled 94%, which was used earlier in this study and contained alpha phase, were given 10 min anneals at temperatures from 200 to 300°C. The density data, obtained at room temperature after the anneal, decrease with increasing annealing temperature up to approximately 280°C, where the normal delta phase density is achieved, Fig 6-F. The following mechanism is proposed to account for the observed relationship. At temperatures up to 280°C, the alpha phase originally present transforms to beta or gamma phase plus delta phase. The amount of delta phase formed in this way is related to temperature. As temperature increases the proportion of beta or gamma transforming to delta phase increases until at approximately 280°C the transformation is complete. During cooling to room temperature from temperatures below 280°C, the remaining beta or gamma phases transform back to alpha phase while the delta phase which formed from beta or gamma remains delta phase, at least during the interval of density determination. The immediate net result is a decrease in density of the alpha plus delta phase mixture, the higher the anneal temperature the greater the decrease in density.

3.4.5 The question of interest, as indicated earlier, is the degree of stability of the annealed and cooled alloy during room temperature storage. Accordingly, the specimens given the above annealing treatment were stored at room temperature and, in the case of the 200 and 250°C anneals, specimens were subjected to up to three cycles of cold treatment from room temperature to -54°C, Fig 6-G. The initial density decrease, from 16.30 or 16.31 g/c.c. to 15.94 or 16.95 g/c.c., indicates that approximately 5% alpha phase was present at room temperature after the 200°C anneal. After the 250°C anneal, however, less than 1% alpha phase was present. The rate of density change during storage was much higher after the 200°C anneal than after the 250°C anneal, indicating that a larger amount of the delta phase formed from the beta phase at 200°C was exhibiting metastable behaviour. As annealing temperature is