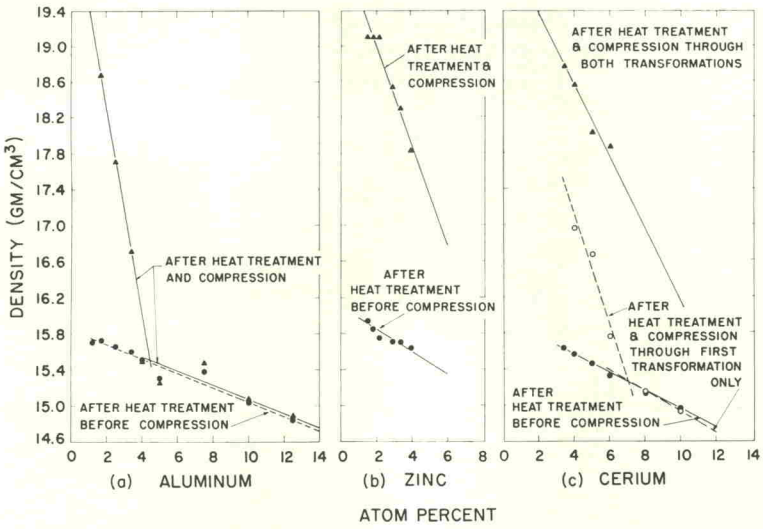

Fig. 11. The effects of composition and of compression on the density of alloys of plutonium delta-stabilized with (*a*) aluminum, (*b*) zinc, and (*c*) cerium.

curves for these alloys intersect at about 9.3 a/o Zn (see discussion on phase diagrams).

Density versus composition curves for both transformations in Pu-Ce alloys are shown in Figure 11(*c*). The intersection of the after compression curves for the lower pressure transformation occurs at 7.1 a/o Ce. Delta-stabilized alloys containing less than this amount of cerium are metastable and transform irreversibly (under compression) into mostly beta phase, while delta-stabilized alloys containing more than 7.1 a/o Ce are thermodynamically stable at room temperature and undergo completely reversible delta-to-beta transformations. Intersection of the extrapolations of the before compression and after compression curves for the higher pressure transformation occurs at 16.3 a/o Ce. Delta-stabilized alloys containing from 3.4 to 6.0 a/o Ce transformed from delta to beta and from beta to alpha on increasing pressure, and these transformations did not reverse when the pressure was reduced. It is expected that all delta-stabilized alloys containing less than 16.3 a/o Ce will behave in a similar manner with the beta-to-alpha transformation becoming more completely reversible with increasing cerium content. Therefore, it is believed that delta-stabilized alloys containing more than 16.3 a/o Ce will transform from delta to beta and from beta to alpha

when pressure is increased, and from alpha to beta and from beta to delta when pressure is decreased; i.e., both transformations are completely reversible. Data on these reversible transformations at high pressures are summarized in Table II. The reversible transformation pressures were obtained by extrapolating or interpolating the transformation pressure versus composition curves (Figs. 4 and 8) to the critical compositions listed in Table II.

TABLE II
Equilibrium Transformation Data for Pu-Rich Pu-Al and Pu-Ce Alloys at High Pressures

Critical composition	Transformation (reversible)	Transformation pressure (atm)
4.5 a/o Al	$\delta \rightarrow \alpha$	10,200
7.1 a/o Ce	$\delta \rightarrow \beta$	3,800
16.3 a/o Ce	$\beta \rightarrow \alpha$	29,500

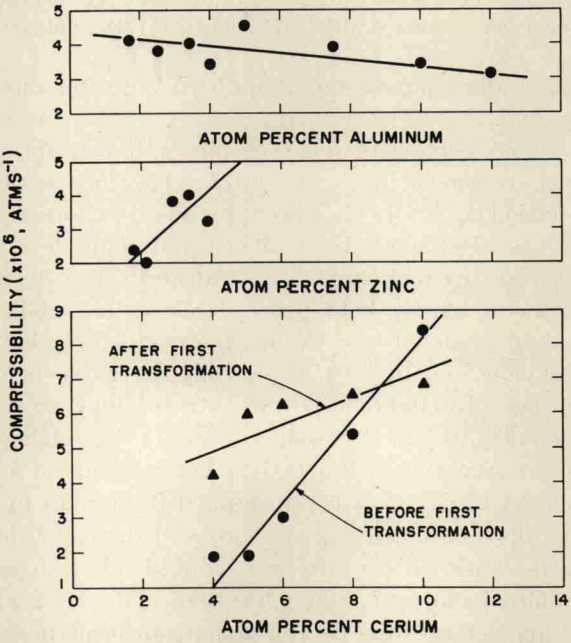

Fig. 12. The effects of aluminum, zinc, and cerium, respectively, on the compressibility of delta plutonium.