Influence of Valency. It was mentioned in the Introduction that the primary reason for making this investigation of cerium-magnesium alloys was to determine if the valency effect[1] previously observed for solutes having valences greater than three, where the solvent is cerium, would also be found in solutes having valences less than three. It had been found[6] that, if a size correction were made for the rare earth solutes that have no unpaired $4f$ electrons, the γ–α transformation temperature for an alloy containing 2 a/o rare earth solute would be essentially the same as that of pure cerium. Furthermore, the data for cerium alloys containing 2 a/o thorium (valence = four) and plutonium (valence = 4.8) indicate that thorium raises the transformation temperature of pure cerium a few degrees and plutonium raises it by almost 15°K[1] (see figure 7). As noted earlier magnesium, which is divalent, lowers the transformation temperature. The data shown in figure 7 indicate that the γ–α electronic transformation in pure cerium depends upon the valence of the solute. That is, as the number of electrons in the valence band increases the α-Ce phase becomes more stable with respect to the γ-Ce phase and, thus, the transformation temperature increases. Previous studies[1,6] had also

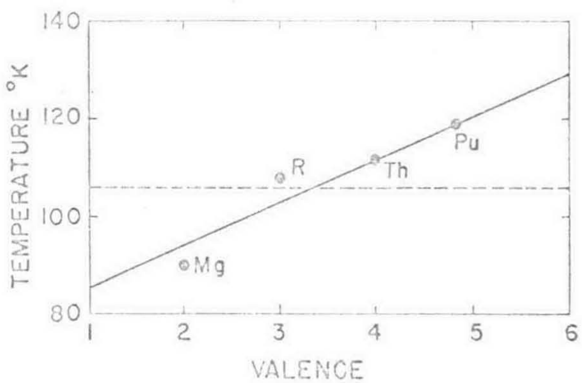

Fig. 7. Influence of the valence of the solute on the $\gamma \rightarrow \alpha$ transformation temperature of cerium for 2 a/o solute additions. The dashed line represents the transformation temperature of pure cerium. The data presented in this figure are normalized to the transformation temperature of the CMC–Ce stock (see Table II).

shown that the solute atom's size and its number of unpaired 4f electrons play an important role in this respect.

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