

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 effect¹ 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 found⁶ 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°K¹ (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

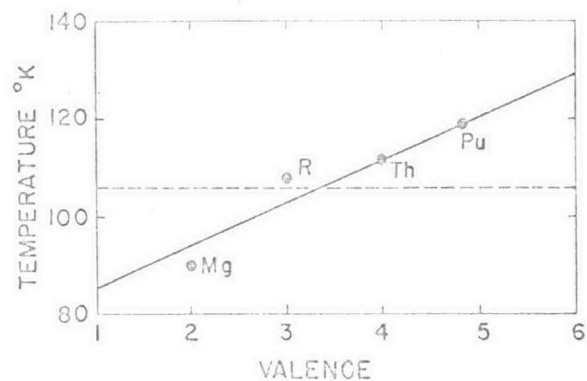


Fig. 7. Influence of the valence of the solute on the $\gamma \rightarrow \alpha$ transformation temperature of cerium for 2 a/o solute additions. The dashed line represents the transformation temperature of pure cerium. The data presented in this figure are normalized to the transformation temperature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