Rare Earth-rich Cadmium Compounds

$RE_4TCd$ ($T = \text{Ni, Pd, Ir, Pt}$)

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New intermetallic compounds $RE_4TCd$ ($RE = \text{Y, La–Nd, Sm, Gd–Tm, Lu} ; T = \text{Ni, Pd, Ir, Pt}$) were synthesized by melting of the elements in sealed tantalum tubes in a high-frequency furnace. They crystallize with the Gd$_4$RhIn-type structure, space group $F\bar{4}3m$, $Z = 16$. The four gadolinium compounds were characterized by single crystal X-ray diffractometer data: $a = 1361.7(1)$ pm, $wR^2 = 0.062$, 456 $F^2$ values, 19 variables for Gd$_4$NiCd; $a = 1382.1(2)$ pm, $wR^2 = 0.077$, 451 $F^2$ values, 19 variables for Gd$_4$PdCd; $a = 1363.6(2)$ pm, $wR^2 = 0.045$, 494 $F^2$ values, 19 variables for Gd$_4$IrCd; $a = 1379.0(1)$ pm, $wR^2 = 0.045$, 448 $F^2$ values, 19 variables for Gd$_4$PtCd. The rare earth atoms build up transition metal-centered trigonal prisms which are condensed via common corners and edges, leading to three-dimensional adamantane-related networks. The cadmium atoms form Cd$_4$ tetrahedra which fill voids left in the prisms’ network.

Key words: Intermetallics, Cadmium, Crystal Chemistry