

The Solid Solution $\text{CeAuIn}_{1-x}\text{Mg}_x$ – Structure, Magnetic Properties and Specific Heat Data

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Four different samples of the solid solution $\text{CeAuIn}_{1-x}\text{Mg}_x$ with $x = 0.2, 0.4, 0.6$, and 0.8 have been prepared from the elements in sealed tantalum tubes in an induction furnace. The samples were characterized through X-ray powder and single crystal data: ZrNiAl type, $P\bar{6}2m$, $Z = 3$, $a = 774.54(7)$, $c = 420.32(10)$ pm, $wR2 = 0.0203$, 395 F^2 values, 15 variables for $\text{CeAuIn}_{0.871}\text{Mg}_{0.129}$, $a = 775.25(7)$, $c = 419.36(10)$ pm, $wR2 = 0.0488$, $\text{BASF} = 0.10(1)$, 397 F^2 values, 16 variables for $\text{CeAuIn}_{0.640}\text{Mg}_{0.360}$, $a = 774.62(7)$, $c = 420.13(10)$ pm, $wR2 = 0.0435$, 376 F^2 values, 15 variables for $\text{CeAuIn}_{0.445}\text{Mg}_{0.555}$, $a = 773.80(11)$, $c = 420.82(8)$ pm, $wR2 = 0.0415$, 392 F^2 values, 15 variables for $\text{CeAuIn}_{0.228}\text{Mg}_{0.772}$. The lattice parameters show no pronounced changes within the solid solution. The largest shift occurs for the x parameter of the mixed occupied In/Mg positions. Due to the difference in size, the trigonal prisms around the Au1 atoms at the origin become smaller with an increasing content of magnesium. The In/Mg–In/Mg distances decrease from 334.5 ($\text{CeAuIn}_{0.871}\text{Mg}_{0.129}$) to 328.3 ($\text{CeAuIn}_{0.228}\text{Mg}_{0.772}$) pm, and consequently one observes also shorter bonds to the Au1 atoms with an increasing content of magnesium concentration. Susceptibility measurements reveal trivalent cerium for all $\text{CeAuIn}_{1-x}\text{Mg}_x$ compounds, with no evidence sign of magnetic ordering down to 2 K. The disorder created by chemical substitution destroys the long-range magnetic ordering which can be attributed to the triggering of non Fermi-liquid (NFL) like behavior.

Key words: Cerium Compounds, Intermetallics, Crystal Chemistry, Magnetism