Synthesis, Structure, and Magnetic Properties of EuAgCd and YbAgCd

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Dedicated to Professor Dr. H. P. Fritz

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Cadmium, Crystal Structure, Magnetic Properties

New intermetallic compounds EuAgCd and YbAgCd were synthesized in quantitative yield by reaction of the elements in sealed tantalum tubes in a high-frequency furnace. Both compounds were investigated by X-ray diffraction on powders and single crystals: KHg₂ type, Imma, \( a = 490.41(8), b = 771.0(1), c = 834.4(2) \) pm, \( wR^2 = 0.0624, 255 F^2 \) values, 12 variables for EuAgCd, and MgZn₂ type, \( P6_3/mmc, a = 584.66(5), c = 946.83(9) \) pm, \( wR^2 = 0.0502, 187 F^2 \) values, 11 variables for YbAgCd. Owing to the very small difference in scattering power, no long range ordering of the silver and cadmium atoms is evident from the X-ray data, although Ag-Cd ordering is expected. The silver and cadmium atoms randomly occupy the mercury and zinc positions of the KHg₂ and MgZn₂ type structures, respectively. In EuAgCd the [AgCd] substructure consists of strongly puckered, orthorhombically distorted Ag₃Cd₃ hexagons, while a three-dimensional network of face- and corner-sharing tetrahedra is observed in YbAgCd. The rare earth atoms fill the space between the Ag₃Cd₃ hexagons (EuAgCd) or within the three-dimensional tetrahedral network (YbAgCd). Magnetic susceptibility measurements indicate Pauli paramagnetism for YbAgCd and Curie-Weiss behavior above 60 K for EuAgCd with an experimental magnetic moment of 7.82(3) \( \mu_B/\text{Eu} \) indicating divalent ytterbium and europium. Ferromagnetic ordering at \( T_C = 28.0(5) \) K is observed for EuAgCd. At 2 K and 5 T the saturation magnetization is 5.85(5) \( \mu_B/\text{Eu} \).