STRUCTURAL AND MAGNETIC PROPERTIES OF $GdNi_{5-x}Ge_x$

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Structural and magnetic properties have been studied for a series of $GdNi_{5-x}Ge_x$ samples (x = 0, 0.3, 0.6, 0.9). All of the samples crystallize in the hexagonal $CaCu_5$ type of crystal structure (space group *P*6/*mmm*). The substitution of Ge for Ni results in an increase of the lattice parameters *a*, *c* and unit-cell volume *V*. Magnetic measurements were performed in external magnetic fields up to 14 T in the temperature range 1.7-400 K. The saturation magnetization at 4 K is close to 6.5 μ_B/f.u. and does not depend on the composition. With increasing Ge concentration the magnetization decreases, and the Curie temperature (T_C) decreases almost linearly from 33 to 18 K for x = 0 and 0.9, respectively. In low magnetic fields (0.005 T) for alloys with x = 0.6 and 0.9 the presence of additional magnetization taking its origin in the Ni sublattice is observed. The Arrott plots show that the magnetic phase transition is of second-order in these alloys. The magnetic entropy changes, $-\Delta S$, as a function of temperature and magnetic field were calculated from isothermal magnetization curves using the Maxwell relation. The maximum values of $-\Delta S$ at T_C with a magnetic field change from 0 to 5 T are 10.6, 10.9, 5.5 and 5.7 J/kg K for x = 0, 0.3, 0.6, and 0.9, respectively.

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