Crystal structure and magnetic properties of $PrNi_9Si_4$

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The existence of a new rare-earth nickel silicide, $PrNi_9Si_4$, was established. Its crystal structure was determined from X-ray powder diffraction data. The profile and structure parameters were refined using the Rietveld method starting from coordinates of the structure type $CeNi_{8.5}Si_{4.5}$ in space group $I4/mcm$ (a=7.8377(12), c=11.4861(17) Å). At the first stages of the refinement the sites occupied by small atoms (Ni and Si) were considered as statistical mixtures. The refined compositions of the sites indicated fully ordered distribution of atoms. Magnetic measurements were carried out in the temperature range 1.72-400 K in magnetic fields up to 5 T using SQUID magnetometer. The $PrNi_9Si_4$ compound is a temperature dependent paramagnet with no distinct feature in its $\chi(T)$ that might hint at any phase transition at low temperatures. The isothermal magnetization measured at T=1.72 K exhibits paramagnetic behavior. Above 50 K the magnetic susceptibility can be approximated by a modified Curie-Weiss law (μ_{eff}=3.43 μ_B, θ=-3.7(2) K, χ_0= 8.76(9)$\cdot 10^{-4}$ emu/mol).