

Coexistence of ferromagnetism and spin-glass behaviour in CeNiSb_3

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We present a comprehensive investigation of the structural and magnetic properties of CeNiSb_3 , compound crystallizing in the orthorhombic LaPdSb_3 -type structure (space group $Pbcm$). DC magnetization measurements confirm long-range ferromagnetic ordering below the Curie temperature $T_C = 7.2$ K, accompanied by marked magnetic irreversibility. In the ordered phase, CeNiSb_3 exhibits strong magnetic anisotropy with the c -axis as the easy direction. Additionally, a field-induced spin-reorientation transition is observed along the b -axis at $T_{C'} = 6.8$ K. The magnetic entropy change further supports the ferromagnetic transition and underscores the anisotropic character of the magnetic interactions. Non-equilibrium spin-dynamics measurements reveal a clear memory effect, and thermoremanent magnetization relaxations follow a stretched-exponential form with $\beta = 0.30$, indicative of spin-glass-like behaviour. This is corroborated by AC susceptibility, which shows a frequency-dependent cusp associated with spin-glass freezing. Power-law analysis yields a characteristic relaxation time of 10^{-10} s, consistent with a cluster-type spin-glass state below the freezing temperature T_f . Under applied magnetic field, the AC susceptibility evolves from a single cusp to a double-peak structure, providing strong evidence for the coexistence of reentrant spin-glass and ferromagnetic ordering below T_C in CeNiSb_3 .

References:

[1] Singh H., Mishra P. K., Kumar G., Gautam A., Umetsu R. Y., Chatterjee R., and Ganguli A. K. Coexistence of ferromagnetism and spin-glass behaviour in CeNiSb_3 . (Communicated)