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Reentrant Spin-Glass State Formation in Polycrystalline Er_2NiSi_3

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Abstract : Magnetically frustrated systems are of great interest and one of the most adorable topics for the researcher of condensed matter physics, due to their various interesting properties, viz. ground state degeneracy, finite entropy at zero temperature, lowering of ordering temperature, etc. Ternary intermetallics with the composition RE_2TX_3 (RE = rare-earth element, T= d electron transition metal and X= p electron element) crystallize in hexagonal AlB_2 type crystal structure (space group P6/mmm). In a hexagonal crystal structure with the antiferromagnetic interaction between the moments, the center moment is geometrically frustrated. Magnetic frustration along with disorder arrangements of non-magnetic ions are the building blocks for metastable spin-glass ground state formation for most of the compounds of this stoichiometry. The newly synthesized compound Er_2NiSi_3 compound forms in single phase in AlB_2 type structure with space group P6/mmm. The compound orders antiferromagnetically below 5.4 K and spin freezing of the frustrated magnetic moments occurs below 3 K for the compound. The compound shows magnetic relaxation behavior and magnetic memory effect below its freezing temperature. Neutron diffraction patterns for temperatures below the spin freezing temperature have been analyzed using FULLPROF software package. Diffuse magnetic scattering at low temperatures yields spin glass state formation for the compound.

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