Antiferromagnetic ordering and Kondo effect in single-crystalline Ce_2NiSi_3

Maria Szlawska and Dariusz Kaczorowski
Institute of Low Temperature and Structure Research, Polish Academy of Sciences,
P. O. Box 1410, 50-950 Wrocław, Poland

The compound Ce_2NiSi_3 crystallizes with a disordered hexagonal structure of the AlB_2-type. Its physical properties have been studied by means of magnetization, electrical resistivity and heat capacity measurements, performed down to 0.4 K in magnetic fields up to 9 T on an oriented single-crystalline specimen. Occurrence of distinct anomalies in the bulk characteristics signal an antiferromagnetic ordering that sets in at $T_N = 3.2$ K. In the ordered state, the *ab* component of the magnetization is much larger than that taken along the hexagonal *c* axis, and exhibits a clear metamagnetic-like transition in a field of 1 T at 0.5 K. In the paramagnetic region, both components of the magnetic susceptibility follow the Curie-Weiss law with the effective magnetic moments being close to that predicted for free Ce^{3+} ions. Large negative values of the paramagnetic Curie temperature hint at significant contribution due to Kondo interactions. This latter conjecture has been supported by the observation of negative logarithmic slopes in the temperature-dependent magnetic contributions to the electrical resistivity, as well as by the finding of enhanced electronic contribution to the specific heat at low temperatures. Altogether, our experimental results suggest that Ce_2NiSi_3 is an antiferromagnetic Kondo lattice with heavy-fermion ground state.

9.7 cm

13.4 cm

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Corresponding author :
Maria Szlawska

Address for correspondence :
Institute of Low Temperature and Structure Research, Polish Academy of Sciences,
P. O. Box 1410, 50-950 Wrocław, Poland

Email address :
M.Szlawska@int.pan.wroc.pl