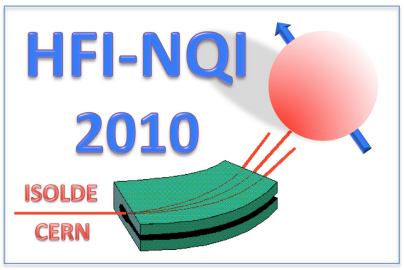

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Low Temperature Nuclear Orientation Studies of the Magnetic Structures of RNiAl4 in Applied Magnetic Fields

Thursday, September 16, 2010 2:40 PM (20 minutes)

The family of metamagnetic compounds RNiAl4 (R = rare earth) exhibits a range of interesting magnetic behaviours. There are multiple magnetic phases, and crystal field driven differences in anisotropy and behaviour when different rare earth ions (R) are present in the compound. TbNiAl4 is one illustrative example. It has two phase transitions (three phases) as a function of temperature in low applied magnetic field, and also at least three phases as a function of applied magnetic field at low temperature [1]. Aligned with the first of these field driven transitions is a large inverse magneto-caloric effect (MCE) [2]. Recent neutron diffraction studies carried out on single crystal TbNiAl4, in applied magnetic fields, show the onset of an incommensurate antiferromagnetic ordered phase above the first field induced phase transition [3]. This observation vindicates the existence of the higher entropy state at higher applied field that is required for an inverse MCE but contradicts the predictions of other authors who suggest a spin flop transition [4]. Low Temperature Nuclear Orientation (LTNO) can also be usefully applied to TbNiAl4 and other RNiAl4 compounds to investigate magnetic structure. In the case of the Tb compound, neutron activation is used to create in situ 160Tb LTNO probes. However, as we found recently, TbNiAl4 crystals must be annealed after thermal neutron irradiation in order to remove damage and restore full gamma-ray anisotropy [5]. In this paper, we present new LTNO results for annealed TbNiAl4, in applied fields extending to 9 tesla. These results support the model of magnetic struture revealed by the earlier neutron diffraction studies. LTNO is also applied to crystals of compounds with R = Nd and Pr. These additional studies magnetic fields sufficient to traverse the respective first metamagnetic transitions were also used and behaviours similar to the TbNiAl4 case were observed.

Are you a student, a delegate from developing countries or a participant with physical needs and would like to apply for a sponsored accomodation. Please answer with yes or no.

no

Please specify whether you would prefer an oral or poster contribution.

poster

Summary

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