

Magnetism and Magnetic Structure of Nd_7Rh_3

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The intermetallic compound Nd_7Rh_3 crystallizes in a Th_7Fe_3 type hexagonal structure, in space group $P6_3mc$. Nd in this compound occupies three non-equivalent sites (6c, 12d and 2b) where as Rh resides at the site 12b. The magnetization studies show two antiferromagnetic (AFM) phase transitions at 32 K and 10 K, and a field induced first-order magnetic transition at a field strength of 1 Tesla at 2 K. In order to understand the magnetic behavior we have carried out neutron diffraction (ND) studies on polycrystalline Nd_7Rh_3 at various temperatures between 2 and 45 K. ND patterns were also recorded at T = 2K in the presence of applied magnetic fields from 0 to 5 Tesla. ND experiments on Nd_7Rh_3 were carried out using wavelengths $\lambda = 1.48\text{\AA}$, 2.45\AA and 2.8\AA respectively in order to cover a larger Q-range. ND patterns of Nd_7Rh_3 do not exhibit any AFM peaks in the entire Q-range studied; instead a long-range ferromagnetic order is established, which implies that the signatures of AFM order seen in magnetization are not representative of any long-range AFM order but could possibly arise due to a ground state comprising a dominant ferromagnetic long range order competing with antiferromagnetic correlations.

9.7 cm

13.4 cm

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