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Electrical resistivity and the thermodynamic properties of the ferromagnet Nd2Pt2In

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The ferromagnet Nd2Pt2In compound was investigated by means of electrical resistivity, &rho(T), magnetic susceptibility, &chi(T), magnetization, M(μ0H), heat capacity, Cp(T) and magnetocaloric effect (MCE). Powder X – ray diffraction results confirm the tetragonal Mo2FeB2 – type crystal structure with space group P4/mbm (No. 127). At high temperatures, &rho(T) data shows metallic behaviour with a downward curvature and that is described by the Bloch – Gruneissen – Mott's relation. At low temperature, &rho(T) data shows an anomaly associated with ferromagnetism phase transition at TC = 18 K. Below TC, &rho(T) is well described by a spin – wave dispersion with energy gap, &Delta = 15.7(9) K. &chi(T) data at high temperatures follows the Curie – Weiss relationship given and effective magnetic moment value, μeff = 3.61(2) μB and the Weiss temperature constant &thetap = 16(1) K. The observed μeff value is close to the value of 3.62 μB expected for the Nd3+ - ion. At low temperatures, &chi(T) data exhibit a sharp rise characteristic of ferromagnetic (FM) materials. TC was estimated at the minimum of d&chi(T)/dT curve at TC = 17.8 K, which is close to the value of 18 K observed in &rho(T) data. Cp(T) data confirms the FM phase transition at TC = 17.9 K taken at the midpoint of the maximum slope of the &lambda - type anomaly and close to the values of 18 K and 17.8 K observed in 7rho(T) and &chi(T) data respectively. The 4f – electron specific heat C4f(T), indicates a Schottky – type anomaly at high temperatures associated with crystalline – electric – field (CEF). The Arrott – plot indicate a second – order FM phase transition. The MCE estimated from the magnetization data gives value of 6.25 J/kg.K for a field change of 7T. The isothermal magnetic entropy change maximum (&Delta SMmax) follows a linear behaviour with h2/3 (h being the reduced field) with a negative y – intercept, which confirms the mean – field theory for a send – order phase transition.

Apply to be
 considered for a student
   award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
   PhD, N/A)?

MSc

Main supervisor (name and email)
and his / her institution

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Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

No

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