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## Electrical resistivity and the thermodynamic properties of the ferromagnet Nd<sub>2</sub>Pt<sub>2</sub>In

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The ferromagnet Nd<sub>2</sub>Pt<sub>2</sub>In compound was investigated by means of electrical resistivity,  $\rho(T)$ , magnetic susceptibility,  $\chi(T)$ , magnetization,  $M(\mu_0H)$ , heat capacity,  $C_p(T)$  and magnetocaloric effect (MCE). Powder X – ray diffraction results confirm the tetragonal Mo<sub>2</sub>FeB<sub>2</sub> – 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  $T_C = 18$  K. Below  $T_C$ ,  $\rho(T)$  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,  $\mu_{eff} = 3.61(2)$   $\mu_B$  and the Weiss temperature constant  $\theta = 16(1)$  K. The observed  $\mu_{eff}$  value is close to the value of 3.62  $\mu_B$  expected for the Nd<sup>3+</sup> – ion. At low temperatures,  $\chi(T)$  data exhibit a sharp rise characteristic of ferromagnetic (FM) materials.  $T_C$  was estimated at the minimum of  $d\chi(T)/dT$  curve at  $T_C = 17.8$  K, which is close to the value of 18 K observed in  $\rho(T)$  data.  $C_p(T)$  data confirms the FM phase transition at  $T_C = 17.9$  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  $\rho(T)$  and  $\chi(T)$  data respectively. The 4f – electron specific heat  $C_{4f}(T)$ , 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 ( $\Delta S_{Mmax}$ ) follows a linear behaviour with  $h^{2/3}$  (h being the reduced field) with a negative y – intercept, which confirms the mean – field theory for a second – 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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