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Investigation of the Magnetic Ground State of PrRu_2Ga_8 Compound

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We have investigated the ground state properties of the orthorhombic structure compound PrRu_2Ga_8 which was first announced by the group of Jeitschko [1]. The compound crystallizes in the CaCo_2Al_8 -type structure, belonging to space group $Pbam$ (No. 55). Specific heat data shows a λ -type anomaly at $T_N = 3.3$ K, indicating a bulk phase transition probably of antiferromagnetic nature. At the Neel temperature, the entropy approaches the value of 4.66 J/mol.K which is about $0.8R\ln 2$, where R is the universal gas constant. The dc magnetic susceptibility, $\chi(T)$ confirms the anomaly at 3.3 K while $1/\chi(T)$ follows the Curie-Weiss law down to low temperatures, with the calculated effective magnetic moment, $\mu_{\text{eff}} = 3.47(2) \mu_B$ and paramagnetic temperature, $\theta_p = -7.8(1)$ K. This magnetic moment value is in good agreement with the Hund's rule theoretical value of $3.58 \mu_B$ for a free Pr^{3+} ion. The electrical resistivity data also show an anomaly at T_N and follows a metallic behavior at high temperatures. The Pr^{3+} in this structure type has a site symmetry of C_s which predicts a crystal electric field (CEF) splitting of the $J = 4$ multiplet into 9 singlets and thus rule out in principle the occurrence of spontaneous magnetic order. In this work we discuss the magnetic order in PrRu_2Ga_8 in line with an induced type of magnetism resulting from the admixture of the lowest CEF level with the higher ones [2].

Summary

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

Yes

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

PhD

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)?

Yes

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