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## Magnetic and thermodynamic properties of the CelrGa4 compound.

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A polycrystalline sample of CeIrGa4 was prepared by an arc-melting technique using high-purity elemental constituent elements on a water-cooled copper plate under ultra-high pure argon atmosphere. This compound crystallizes in an orthorhombic structure having the CeOsGa4 structure type belonging to the space group Pmma [1]. The sample was characterized by powder X-ray diffraction spectra which were refined using EXPO software, where the lattice parameters were found to be; a = 9.456(3) Å, b = 8.726(2) Å and c = 7.547(3)Å. In this work, we study the physical and magnetic properties of this compound, by heat capacity Cp(T), magnetization M(B), magnetic susceptibility  $\chi(T)$  and electrical resistivity  $\rho(T)$ . In the  $\chi(T)$  results a Curie-Weiss behaviour is followed above 50 K, yielding an effective magnetic moment, Øeff = 2.43 (2) ØB/mol-Ce, which is close to the theoretical value for a free Ce3+ ion. This indicates that Ce3+ is the only magnetic species in this compound. The paramagnetic Weiss temperature is  $\square p = -97.42$  (2) K. The negative value of the Weiss temperature indicates that AFM interactions dominate. The magnetization shows typical paramagnetic behaviour above 15 K, where M is linear in B up to 8 T. However, in the T = 2 K isotherm a strong curvilinear behaviour is observed with a weak tendency towards saturation and a steep rise in M at very small fields. This suggests a possible phase transition at very low T in this compound, even though our maximum field extracts only about 0.5  $\mu$ B/Ce. The electrical resistivity follows a  $\rho(T)$   $\sim$  - log(T) behaviour below room temperature which is in evidence of incoherent Kondo scattering effects in this compound. A coherence or Kondo-lattice peak in  $\rho(T)$  develops at 90 K, below which  $\rho$  decreases sharply. Above 2 K,  $\rho(T)$  shows an anomalous near - linear rise with temperature. The electronic specific heat, Cp(T)/ T increases sharply below 10 K to reach a very high value of 600 mJ/mol.K2 at 2 K. Our interpretation of the physics in CeIrGa4 is that this is a new example of a strongly correlated, Kondo- lattice system. Future studies will focus upon the low temperature region to search for a possible magnetic phase transition.

## References

[1] M. Schlüter and W. Jeitschko, Z. Anorg. Allg. Chem. 628, 628 (2002).

## Apply to be<br> considered for a student <br> &nbsp; award (Yes / No)?

yes

## Level for award<br>&nbsp;(Hons, MSc, <br> &nbsp; PhD, N/A)?

MSc

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