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## Magnetic and strong correlation effect in $\text{CeT}_2\text{Al}_8$ (T=Fe,Co)

Wednesday, 13 July 2011 17:00 (2 hours)

We present specific heat, electrical resistivity, susceptibility, and thermopower measurements on the two novel intermetallic compounds  $\text{CeFe}_2\text{Al}_8$  and  $\text{CeCo}_2\text{Al}_8$ . They form in an orthorhombic crystal structure of space group  $\text{Pbam}$ . In the unit cell representation Ce atom occupies only one lattice site, having Ce-Ce interatomic distance of  $4.03\text{\AA}$ . Magnetic susceptibility of  $\text{CeFe}_2\text{Al}_8$  in the range of 1.9K - 400K yields an effective paramagnetic moment value of  $3.89\mu_B$  together with prevailing antiferromagnetic interaction through Weiss temperature  $\Theta = -745.8\text{K}$ . The overall temperature dependence suggests valence instability in this compound and we model the appearance of broad peak around  $T=230\text{K}$  in the susceptibility to a  $T^{\text{sup}}$

$2^{\text{sup}}\ln T$  dependence attributed to an intermediate valent state. On the other hand for  $\text{CeCo}_2\text{Al}_8$  the local moment state is depicted through an effective moment close to the free  $\text{Ce}^{3+}$  ion value. No long-range magnetic ordering is found in either of the two compounds down to 1.9K. The magnetic contribution of electrical resistivity on  $\text{CeFe}_2\text{Al}_8$  and  $\text{CeCo}_2\text{Al}_8$  compounds follows  $-\ln T$  behavior at intermediate temperatures which is typical of incoherent Kondo interactions between conduction electrons and magnetic Ce ions. A Fermi liquid behavior in resistivity measurement is observed in  $\text{CeFe}_2\text{Al}_8$  compound towards the ground state, whereas clear deviations from standard Fermi liquid behavior are indicative of strong electronic correlation effects in  $\text{CeCo}_2\text{Al}_8$ . At 2K the electronic specific heat of this compound reaches  $\gamma = 0.106\text{J/mol}\cdot\text{K}^{\text{sup}2}$ , and exhibits a  $-\ln T$  divergence towards  $T \rightarrow 0$ . We explain this behavior in terms of quantum criticality that stems from low-lying magnetic ordering effects. In studies of the thermoelectric power, a maximum is reached at  $T=140\text{K}$  ( $S=24\mu\text{V/K}$ ) and  $T=30\text{K}$  ( $S=23\mu\text{V/K}$ ) for  $\text{CeFe}_2\text{Al}_8$  and  $\text{CeCo}_2\text{Al}_8$  compounds respectively. We propose a description for this behavior in terms of formation of fine structure in the electronic density of states near the Fermi energy ( $E_F$ ).

Level (Hons, MSc, **<br> &nbsp; PhD, other**)?

PhD Physics

Consider for a student **<br> &nbsp; award (Yes / No)**?

yes

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

yes

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