

Effects of Fe substitution for isoelectronic Ru on the magnetic and transport properties of $\text{CeRu}_2\text{Al}_{10}$

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We have investigated the effects of magnetic Fe ion substitution in $\text{Ce}(\text{Ru}_{1-x}\text{Fe}_x)_2\text{Al}_{10}$ on the magnetic and transport properties, when the Kondo insulator $\text{CeRu}_2\text{Al}_{10}$ with anomalous antiferromagnetic order at $T_N = 27$ K [1] is fully transformed into the archetypal non-ordered Kondo insulator $\text{CeFe}_2\text{Al}_{10}$ [2]. The characteristic Kondo temperature T_K is determined from the magnetic susceptibility, and demonstrates a linear dependence on Fe concentration between 0.6 and 1. With increasing x , the positive maximum in the thermoelectric power just below T_N enhances gradually and reaches up to ~ 80 $\mu\text{V}/\text{K}$ (at $T = 40$ K) for $x = 0.8$, which is remarkably as high as ~ 4 and ~ 1.5 times the corresponding values in $\text{CeRu}_2\text{Al}_{10}$ and $\text{CeFe}_2\text{Al}_{10}$ respectively. The magnitude of the lattice thermal conductivity is found to be nearly independent of x , while the electronic thermal conductivity on the other hand decreases by an order of magnitude when x increases from 0 to 0.8. We discuss our results in terms of the extreme electronic sensitive nature between $\text{CeRu}_2\text{Al}_{10}$ and $\text{CeFe}_2\text{Al}_{10}$.

References:

- [1] A.M. Strydom, *Physica B* **404** (2009) 2981.
- [2] Y. Muro et. al, *J. Phys. Soc. Jpn.* **78** (2009) 083707.