Thermopower in $\text{ReFeAsO} \ (\text{Re}=\text{La, Sm, Pr, Ce})$

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Abstract

Thermoelectric measurements have been always pointed out as sensitive probes for many properties of correlated materials. In particular combined with other transport properties (resistivity, magnetoresistivity, Hall effect) thermoelectric properties can be crucial to extract information about the multiband nature and the electronic structure of complex compounds. In order to exploit these techniques it is necessary to create a reliable model to analyze experimental data which often contain many different contributions.

We measured the Seebeck effect as a function of temperature of polycrystalline compounds of $\text{ReFeAsO}$ observing a very complicated behavior. All the samples exhibit a sharp step in correspondence of the AFM transition ($T_N=140 \ \text{K}$) and a wide bump peaked around 50 K not explainable in terms of the diffusive contribution described by Mott formula. Analyzing deeply some samples of LaFeAsO we verified that this bump is strongly sample-dependent probably due to the role of crystallographic disorder. Moreover we measured the Seebeck effect as a function of the magnetic field (up to 30 T) observing a strong dependence only when the temperature is fixed around the bump. These features suggest the magnon drag effect as a good candidate to explain this phenomenology.

The evidence of a strong magnon drag is a proof of the intimate link between charge carriers and spin excitations in the parent compounds of iron-based superconductors and its understanding can give a crucial contribution to understand magnetically-mediated superconductivity.