

Transport Properties of a New Thermoelectric Material: Giant Figure-of-merit and Possible Applications¹

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This sample has already become well known for its high value of the Seebeck coefficient[1] and reduced thermal conductivity[2], so being a candidate for thermoelectric applications[3]. In this paper we present transport properties of specially treated sample. The Seebeck coefficient S revealed values exceeding $100 \mu\text{V}/\text{K}$ in the wide temperature range, reaching a maximum of more than $500 \mu\text{V}/\text{K}$ at temperature $T = 200\text{K}$. The figure of merit

$$ZT = \frac{S^2\sigma T}{\kappa}, \quad (1)$$

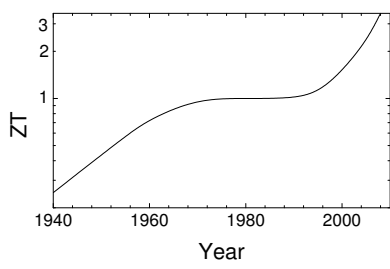
is obtained with a help of electrical resistivity σ and thermal conductivity κ measurements. The results point to thermoelectricity in the context of strong correlation. We argue that a giant figure-of-merit is fingerprint of a heavy quasi-particles liquid with a long mean-free-path. Besides its promising thermoelectric performance, this sample exhibit a rich variety of interesting ground state properties. At low temperatures the sample transforms from a coherent nonmagnetic Kondo lattice to a nonmagnetic single ion Kondo system and finally to a superconductor.

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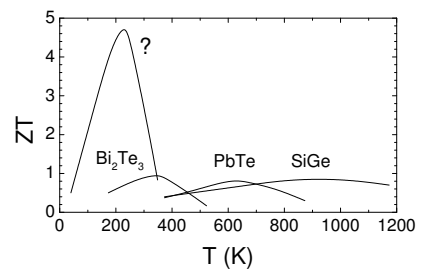
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(a)



(b)

Figure 1: (a) The best figure-of-merit values in a log scale during the last seventy years. (b) A giant figure-of-merit of our sample compared with the values of some typical thermoelectric materials.