Highlights

Novel superconducting and functional materials for energy and environment - 2018

Unusual thermoelectric properties of $BaFe_2As_2$ in high magnetic fields

M. Meinero[1,2], F. Caglieris[3], G. Lamura[2], I. Pallecchi[2], A. Jost[4], U. Zeitler[4], S. Ishida[5], H. Eisaki[5] and M. Putti[1,2]

[1]Dipartimento di Fisica, Università di Genova, Via Dodecaneso 33, 16146 Genova, Italy
[2]CNR-SPIN, C.so F. M. Perrone, 24, 16152 Genova, Italy
[3]IFW Dresden, Helmholtz Strasse 33 Dresden, Germany
[4]High Field Magnet Laboratory (HFML-EMFL), Radboud University, Toernooiveld 7, 6525ED Nijmegen, The Netherlands
[5]National Institute of Advanced Industrial Science and Technology, Tsukuba 305-8568, Japan

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Electric and thermoelectric transport properties are mutually intertangled in diffusive transport equations. In particular, in high mobility multi-band systems an anomalous behavior may occur, which can be tracked down to the properties of the individual bands. Here, we present magneto-electric and magneto-thermoelectric transport properties of a $BaFe_2As_2$ high quality single crystal, for different magnetic field directions (parallel and perpendicular to the c-axis of the crystal) up to 30 T. We detect an anomalous field dependence of the Seebeck coefficient (Fig. 1a and 1c) and a giant Nernst effect (Fig. 1b and 1d). The extraction of the Peltier tensor coefficients α_{xx}, α_{xy} and α_{xz} (Fig. 2) allows to disentangle the main transport mechanisms into play. The large α_{xy} and α_{xz} values and their field dependence provide evidence of the presence of a high mobility band, compatible with a Dirac dispersion band, crossing the Fermi level and suggest a possible 3-dimensional nature of the Dirac Fermions.

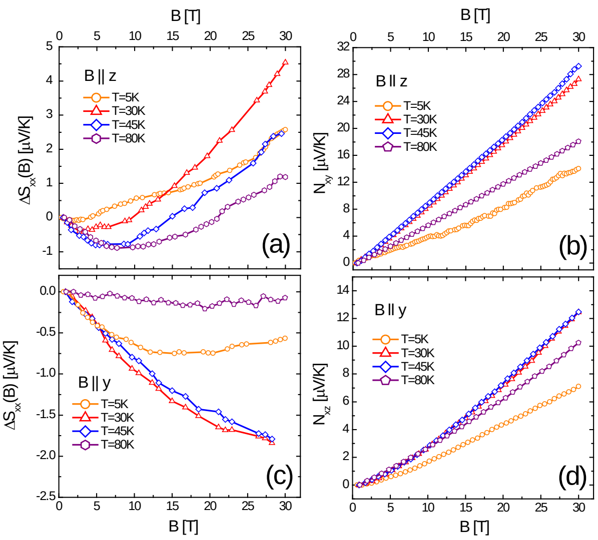

Fig. 1: Magnetic field dependences up to 30 T in the temperature range 5-80K of the Seebeck/Nernst coefficient when B is applied parallel (a/b) and perpendicular (c/d) to the c-axis of the crystal.

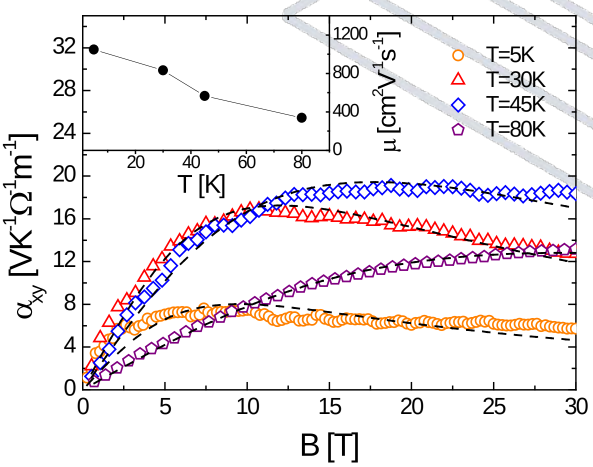

Fig. 2: Magntic field dependences up to 30 T in the temperature range 5-80K of α_{xy}. Dashed lines are the fitting curves of α_{xy} using $\alpha_{xy} = A\mu^2 B/(1+(\mu B)^2)$, where μ is the carrier mobility. Inset: temperature dependence of μ obtained by the fitting