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**Phase diagram and superconducting gap structure of the iron-pnictide superconductor (Ba,K)$Fe_2As_2$**[1]

XIGANG LUO, Department de Physique, Universite de Sherbrooke, Sherbrook, Quebec J1K2R1, Canada

Measurements of the Nernst and Seebeck coefficients were used to delineate the T-x phase diagram of the iron-pnictide superconductor $Ba_{1-x}K_xFe_2As_2$. The sensitivity of these two coefficients to the reconstruction of the Fermi surface caused by the onset of antiferromagnetic order below a temperature $T_N$ allowed us to track $T_N$ precisely as a function of concentration x, even when the electrical resistivity, for example, shows no anomaly at the magnetic transition. In the region of concentrations where superconductivity appears out of an antiferromagnetic normal state ($T_c < T_N$), we investigate the evolution of the superconducting gap structure of $Ba_{1-x}K_xFe_2As_2$ by measuring the thermal conductivity in the T=0 limit. This is a sensitive and directional probe of nodal quasiparticles. As the concentration x is reduced, we find a sudden change in the gap structure from a full gap without nodes to a gap with nodes. We ascribe this change to the onset of antiferromagnetism below a critical doping $x_N$ inside the superconducting phase, whose effect is most likely to alter both the Fermi surface and the angular dependence of the gap. We compare these results with our earlier study on $Ba(Fe_{1-x}Co_x)_2As_2$ [1,2].

[1] M. Tanatar *et al.*, Physical Review Letters **104**, 067002 (2010).
[2] J.-Ph. Reid *et al.*, Physical Review B **82**, 064501 (2010).

[1]This work was performed in collaboration with H. Shakeripour, J. Chang, F. Laliberte, J.-Ph. Reid, N. Doiron-Leyraud, L. Taillefer, M.A. Tanatar, R. Prozorov, H. Q. Luo, Z. S. Wang, H.-H. Wen