Quantum critical regime in the phase diagram of \( K_x \text{Sr}_{1-x} \text{Fe}_2 \text{As}_2 \)

BERND LORENZ, MELISSA GOOCH, TCSUH and Dept. of Physics, University of Houston, BING LV, ARNOLD M. GULOY, TCSUH and Dept. of Chemistry, University of Houston — The electrical and thermoelectric properties of \( K_x \text{Sr}_{1-x} \text{Fe}_2 \text{As}_2 \) are investigated. While the temperature dependence of the resistivity of \( \text{SrFe}_2 \text{As}_2 \) \((x=0)\) and \( \text{KFe}_2 \text{As}_2 \) \((x=1)\) is strongly nonlinear over a large temperature range it becomes surprisingly linear for \( x \) close to \( x_c = 0.4 \) above the superconducting transition. This apparent deviation from the Fermi liquid behavior is similar to the high-\( T_c \) cuprate superconductors and may indicate the existence of a quantum critical regime above the superconducting dome. We show that the temperature dependence of the thermoelectric power \( S \) follows a logarithmic scaling, \( S/T = \text{const.} \times \log(T) \) at the critical value \( x_c \). The experimental results are consistent with a Ginzburg-Landau model for FeAs compounds predicting quantum critical scaling with a dynamical exponent \( z=2 \) and an effective dimension \( d+z=4 \).

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