In-plane resistivity and superconductivity of iron-pnictide superconductors

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Revealing the relationship between the normal-state charge transport and superconductivity is one of the important issue in order to understand the mechanism of unconventional superconductivity. We previously demonstrated that the exponent n of the low temperature resistivity $\rho(T) \sim T^n$ is correlated with superconducting transition temperature T_c for polycrystalline samples of various iron pnictides.[1] We performed in-plane resistivity measurement on single crystals of iron-pnictide superconductors, mainly $BaFe_2As_2$ system. As is well known, the temperature dependence of resistivity is nearly T-linear in Co-doped and P-doped cases, while it is S-shaped in K-doped case. We attempted to fit them in terms of three-component model derived from the decomposition of optical conductivity spectrum; a Drude term($\sigma_D \sim T^{-2}$), an incoherent term ($\sigma_{in} \sim const.$), and a residual resistivity component (ρ_0). We investigate how those components vary among different materials and different doping, and explore their correlation with T_c.

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