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## The normal state transport properties of $\text{Nd}_{1-x}\text{Pr}_x\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$ superconductors and theoretical models

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### Abstract

Polycrystalline samples of  $\text{Nd}_{1-x}\text{Pr}_x\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$  with  $0 \leq x \leq 0.30$  were made by standard solid state methods. The transport and superconducting properties were studied by the resistivity and the thermoelectric power measurements as a function of temperature and doping concentration. The resistance and the thermoelectric power were increased by increasing doping concentration. The pseudogap temperature was measured from downturn deviation in a linear dependence of resistance as a function of temperature. The resistivity, the thermoelectric power, the critical temperature, and the pseudogap temperature results suggested that the hole concentration in  $\text{CuO}_2$  planes was decreased by increasing Pr doping concentration. The resistivity and the thermoelectric power results were analyzed by the bipolaron and the phenomenological narrow band model, respectively. A good agreement between models and data was obtained. On the basis of these models, it was inferred that the localization tendency is one of the main reasons for decreasing the hole concentration in the  $\text{CuO}_2$  plane, which results in the strong depression of the superconductivity.

**Keywords:** superconductivity, thermoelectric power, Pr doping, hole concentration

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