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Disorder induced weak and strong localization and their influence on superconductivity in underdoped Bi2+xSr2-xCuO6 HUIQIAN LUO, PENG CHENG, HAI-HU WEN, National Laboratory for Superconductivity, Institute of Physics, CAS — In-plane resistivity and magnetoresistance(MR) measurements were carried out on high-quality underdoped $Bi_{2+x}Sr_{2-x}CuO_{6+\delta}$ ($0.1 \leq x \leq 0.4$) single crystals. The results show that the superconductivity and the normal state MR behaviors strongly rely on the doping level of samples. In the slightly doping level of Bi, a metallic normal state and a finite superconducting transition temperature are observed, and there is always a positive MR in the normal state which is explained by the fluctuating superconductivity mixed with the transport of quasiparticles. With further doping, the low temperature resistivity shows an up turn together with a negative MR. Detailed analysis on the negative MR in this region may suggest that weak localization effect is dominant. As the superconductivity is depressed by more doping and thus more disorders, the delocalization gets much harder and the spin-order contribution may be involved in MR. Moreover, in the heavily underdoped doping, the superconductivity is suppressed completely and resistivity evolves into a strong localization behavior with a Coulomb gap opening at the Fermi energy. After summarizing the doping dependence of MR, we construct a new phase diagram to illustrate how does the disorder give the influence both on the superconductivity and magnetoresistance.

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