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The Study of Magnetic and Transport Properties in Normal State Eu1.85+yCe0.15-yCu1-yFeyO4+α-δ

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Abstract : Superconductor is a promising material for future applications especially for energy saving because of their advantages properties such as zero electrical resistivity when they are cooled down to sufficiently low temperatures. However, the mechanism describing the role of physical properties in superconductor is far from being understood clearly, so that the application of this material for wider benefit in various industries is very limited. Most of superconductors are cuprate compounds, which has CuO2 as a conducting plane in their crystal structures. The study of physical properties through the partially substitution of impurity for Cu in superconducting cuprates has been one of great interests in relation to the mechanism of superconductivity. Different behaviors between the substitution of nonmagnetic impurity and magnetic impurity for Cu are observed. For examples, the superconductivity and Cu-spin fluctuations in the electron-doped system are suppressed through the substitution of magnetic Ni for Cu more markedly than through the substitution of nonmagnetic Zn for Cu, which is contrary to the result in the hole-doped system. Here, we reported the effect of partially substitution of magnetic impurity Fe for Cu to the magnetic and transport properties in electron-doped superconducting cuprates of Eu1.85+yCe0.15-yCu1-yFeyO4+α-δ (ECCFO) with y = 0.01, 0.02, and 0.05, in order to investigate the mechanism of magnetic and transport properties of ECCFO in normal-state. Magnetic properties are investigated by DC magnetic-susceptibility measurements that carried out at low temperatures down to 2 K using a standard SQUID magnetometer in a magnetic field of 5 Oe on field cooling. Transport properties addressed to electron mobility, are extracted from radius of electron localization calculated from temperature dependence of resistivity. For y = 0, temperature dependence of dc magnetic-susceptibility indicated the change of magnetic behavior from paramagnetic to diamagnetic below 15 K. Above 15 K, all samples show paramagnetic behavior with the values of magnetic moment in every volume unit increased with increasing y. Electron mobility decreased with increasing y. Some reasons for these results will be discussed.

Keywords : DC magnetic-susceptibility, electron mobility, Eu1.85+yCe0.15-yCu1-yFeyO4+α-δ, normal state
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