一次元電気伝導体における超伝導の研究

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Superconducting properties of a Quasi-One-Dimensional Nb_3Te_4 Doped with Hg

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Research Field

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Research Institution

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Research Abstract

The electrical resistivity, thermoelectric power, and specific heat of Nb_3Te_4 inserted with Hg : Hg_xNb_3Te_4 were measured from 0.5K to 300K.The superconductivity and superconducting upper critical field H_<c2> were also measured. Hg insertion suppresses the charge density wave transition at about 80K The anomaly of the resistivity at about 30K is also suppressed by Hg insertion. However, the anomaly of the thermoelectric

power at 30K is not greatly affected by Hg insertion. These results are discussed in terms of the modification of the shape of the Fermi surfaces. The residual resistivity ratio is not affected by Hg insertion. The thermoelectric power is negative indicating a dominant transport by electron at concentrations of x<0.3. While, for concentrations of x<0.3 the thermoelectric power is positive near superconducting transition temperature. With addition of Hg, the superconducting transition temperature is enhanced from 1.9K to 5.4K.The superconducting upper critical field H_<c2> is proportional to the temperature difference from the transition temperature. The ratio H_<c2*>/H_<c2*> of the parallel and the perpendicular to the c axis is 4.5 for concentrations of X<0.3. In contrast, the ratio increases remarkably at about x=0.3 and is about 40 for concentrations of x>0.3. For Nb_3Te_4, although it becomes superconducting at about 2K in the electrical-resistivity measurement, an excess of specific heat due to the superconducting transition was not found down to about 0.5K.However, the excess of specific heat appears by Hg insertion and increases with increasing concentration x. The coefficient of the electronic specific heat is enhanced from 18.7 (mJ/molK^2) for x=0 to 146 (mJ/molK^2) for x=0.4. This is due to a change in dominant transport from electrons to holes.