一次元電気伝導体における超伝導とインターカレーション

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1999 Fiscal Year Final Research Report Summary

Superconductivity and intercalation in one-dimensional conductors

Research Project

Project/Area Number

09640426

Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

固体物性Ⅱ(磁性・金属・低温)

Research Institution

Kanazawa University

Principal Investigator

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Keywords

intercalation / superconductivity / one-dimensional conductor / resistivity / thermoelectric power / charge-density wave / 遷移金属化合物

Research Abstract

The electrical resistivity and the thermoelectric power of NbイイD23イエD2TeイイD24イエD2 inserted with Hg and In have been measured in the temperature range from 1.4 to 300 K : HgイイD2xイエD2NbイイD23イエD2TeイイD24イエD2 and InイイD2xイエD2NbイイD23イエD2TeイイD24イエD2. The magnitude of the resistivity and the residual-resistivity ratio is not greatly affected by addition of Hg or In. The resistivity of NbイイD23イエD2TeイイD24イ

エD2 shows two anomalies at 40 K and 110 K. These resistivity anomalies disappear by addition of Hg. On the contrary, both resistivity anomalies are enhanced when adding a small amount of In and a new resistivity anomaly appears at 160 K for x > 0.3. The anomalies in the thermoelectric power curve also appear at the range in temperature where the resistivity anomalies appear. The sign of the thermoelectric power changes from negative to positive with addition of In. The superconducting transition temperature is enhanced from 1.9 to 5.4 K by addition of Hg. These results are discussed on the basis of the multiband model with electronlike and holelike carriers.
The pressure effect on the superconductivity and on the CDW formation in NbイイD23イエD2XイイD24イエD2 with X=S, Se, and Te has been studied by a resistivity measurement. In both NbイイD23イエD2SイイD24イエD2 and NbイイD23イエD2SeイイD24イエD2, the superconducting-transition temperature TイイD2cイエD2 decreases with increasing pressure. Pressure-induced-lattice stiffening mainly causes the decrease of TイイD2cイエD2 in these compounds. The TイイD2cイエD2 of NbイイD23イエD2TeイイD24イエD2 increases with pressure. The pressure enhancement of TイイD2cイエD2 is mainly due to the increase of N(0) by the recovery of the density of states N(0) associated with the depression of the CDW's. The pressure effect on both CDW-transition temperatures is discussed in terms of both lattice stiffening and collapse of the nesting of the Fermi surfaces.

Research Products (4 results)

All Other

All Publications (4 results)

[Publications] Takanori Kagohashi: "Electrical resistivity and thermoelectric power of a quasi-one-dimensional Nb_3Te_4 single crystal with mercury : Hg_xNb_3Te_4"J. Physics : Condensed Matter. 11(No 33). 6373-6384 (1999)

[Publications] Hiromi Taniguchi: "Pressure effect on the superconductivity and the charge-density-waves in Nb_3Te_4 with S, Se, and Te"PHYSICA B : Condensed Matter. (2000)

[Publications] Takanori Kagohashi: "Electrical resistivity and thermoelectric power of a quasi-one-dimensional NbイイD23イエD2TeイイD23イエD2 single crystal inserted with mercury : HgイイD2xイエD2NbイイD23イエD2TeイイD24イエD2"J. of Physics : Condensed Matter. Vol. 11, No. 3. 6373-6384 (1999)

[Publications] Hiromi Taniguti: "Pressure effect on the superconductivity and the charge-density waves in NbイイD23イエD2XイイD24イエD2 with X=S, Se and Te"Physica B : Condensed Matter. (in press). (2000)

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