

substance: $\text{Tm}_{1-x}\text{Eu}_x\text{Se}$

property: crystal structure, physical properties

(energy gap E_g , lattice parameter a)

$x > 0.3$: semiconductor; $0 < x < 0.2$: metal

E_g 0.2 eV $x = 0.85$

85R,

90N

$x = 0.5$

optical relectivity spectrum: Fig. 1,

90N,

energy level scheme: Fig. 2

81B

a 6.06 Å

E_g 0.120 eV

90N

dE_g/dp -89 meV/GPa

semiconductor-metal transition: 1.34 GPa

90N

pressure and temperature dependence
of resistivity: Fig. 3...6

magnetic susceptibility vs. T : Fig. 7,

Fig. 8; magnetic moment: Fig. 9

References:

- 81B Batlogg, B.: Phys. Rev. B 23(2) (1981) 650.
- 85R Reim, W., Boppart, H., Wachter, P.: J. Magn. Magn. Mater. 52 (1985) 91.
- 89B Borocho, E., Kaldis, E.: Z. Phys. Chem. NF 163 (1989) 117;.
- 90N Neuenschwander, J., Wachter, P.: Physica B 160 (1990) 231.
- 94W Ward, J.W., Haschke, J.M.: "Comparison of 4f and 5f element hydride properties" in: Handbook on the Physics and Chemistry of Rare Earths Vol. 18 - Lanthanides/Actinides: Chemistry, Gschneidner, K.A., Jr., Eyring, L., Choppin, G.R., Lander, G.H. (eds.), Elsevier Science, 1994, p. 293.

Fig. 1.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. **(a), (b)** Optical reflectivity spectrum at 300 K. The bars indicate the calculated intensities of the final-state multiplets after excitations of 4f electrons [81B].

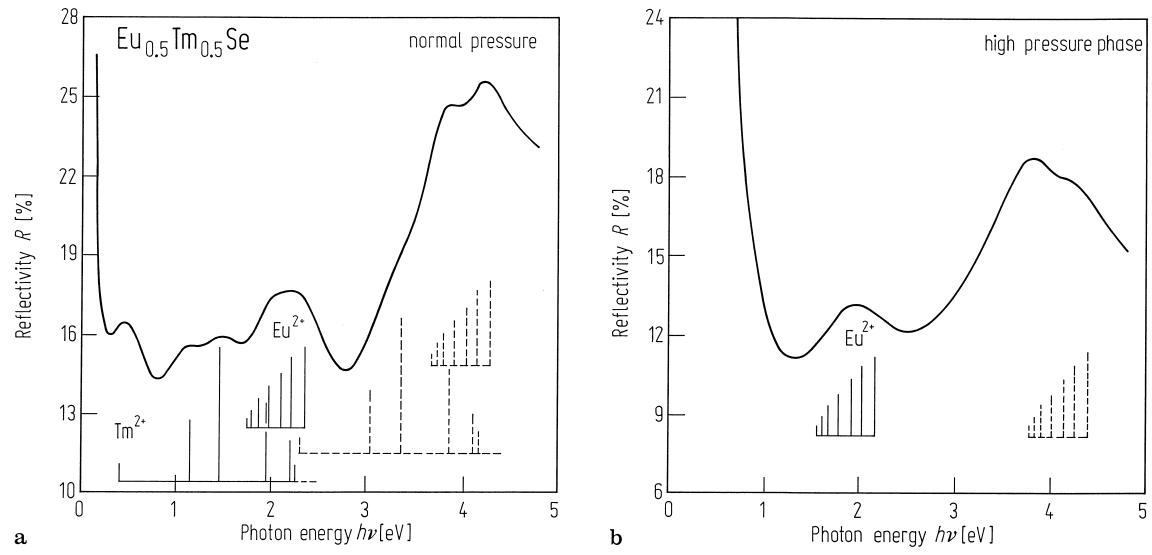


Fig. 2.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Energy-level schemes for semiconducting (normal pressure) and metallic material [89B, 94W].

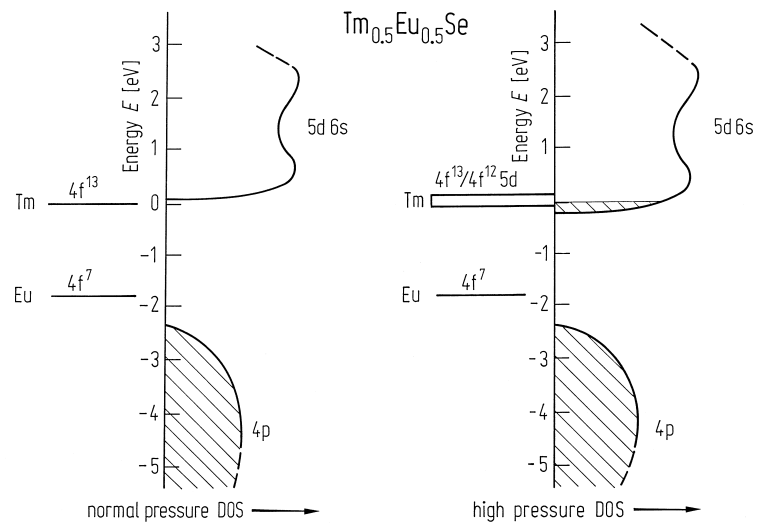


Fig. 3.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Pressure dependence of the electrical resistivity at room temperature, at 150 K and at 50 K [90N].

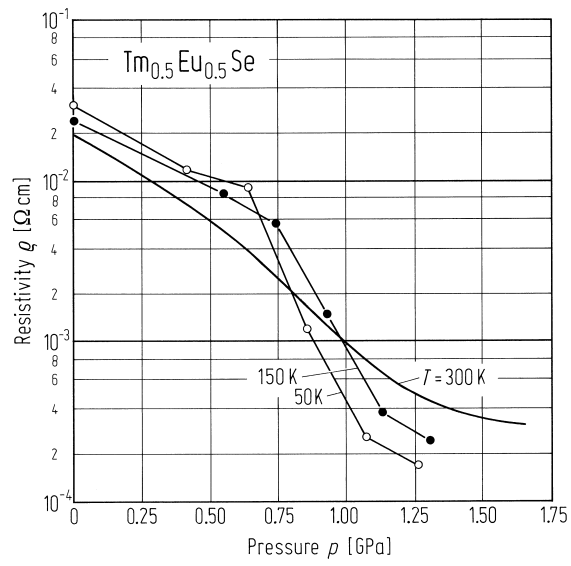


Fig. 4.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Temperature dependence of the electrical resistivity for various pressures. The indicated pressure is the value at room temperature [90N]. Inset shows $\rho(T)$ of metallic state.

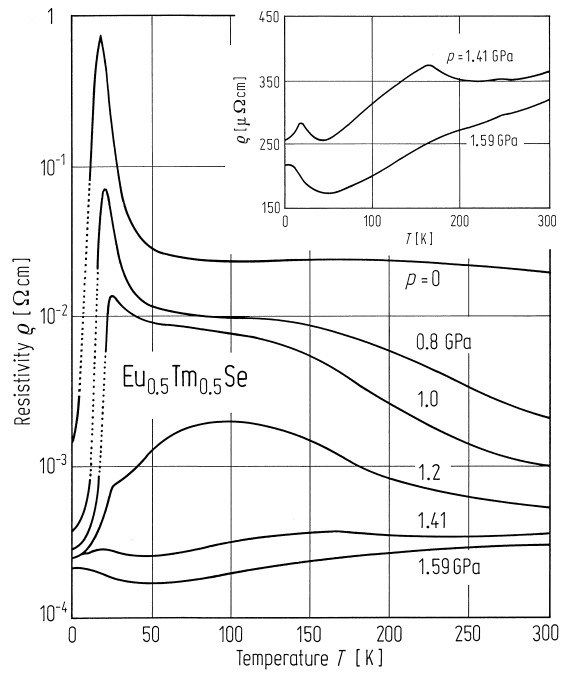


Fig. 5.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Pressure dependence of the electrical resistivity at room temperature [81B].

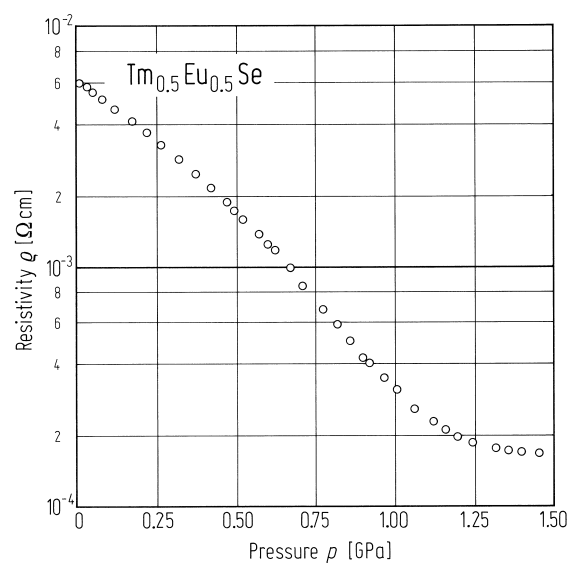


Fig. 6.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Temperature dependence of the electrical resistivity at normal pressure. The strong influence of the magnetic field on the anomaly at the ordering temperature is given in the inset [81B].

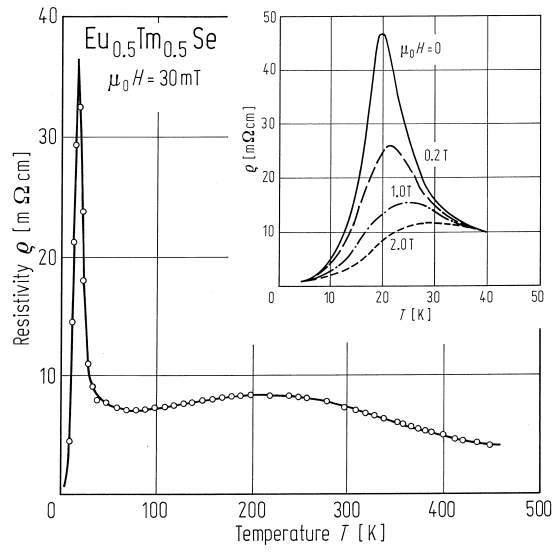


Fig. 7.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Temperature dependence of the induced voltage U_i (magnetic susceptibility) in the pressure range $p(20\text{K}) = 0 \dots 0.81 \text{ GPa}$. Note the considerable increase of the ordering temperature [90N].

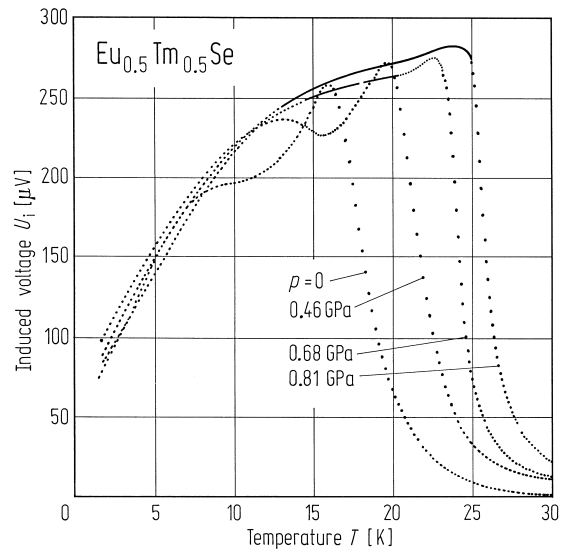


Fig. 8.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Temperature dependence of the magnetic susceptibility (in CGS-emu). In the inset, the ordering point is located at 20.7 ± 0.3 K [81B].

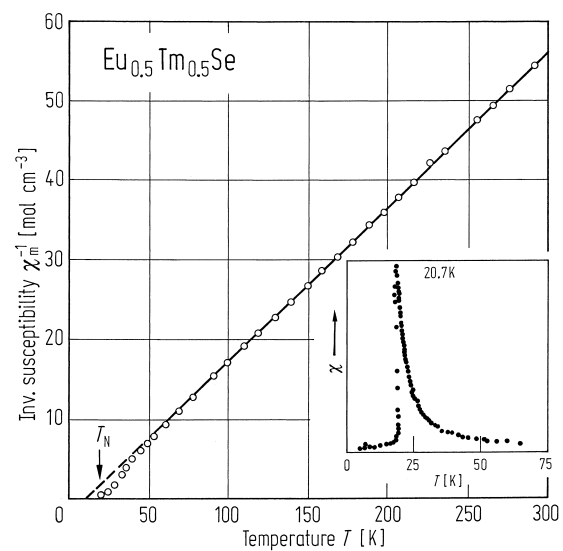


Fig. 9.

$\text{Tm}_{0.5}\text{Eu}_{0.5}\text{Se}$. Magnetic moment per formula unit p_{FU} vs. magnetic field at $T = 4.2 \text{ K}$ [81B].

