substance: EuO
property: crystal structure, physical properties

crystal structure		cubic (O_h^5 – Fm3m)	
lattice parameter			
a	5.1435(1) Å	T = 298.15 K	74M
	5.141 Å		72W
melting point			
T_m	2238(10) K		72S1
	2249(8) K		72R
density			
d	8.197 g cm^{-3}		74M
energy gap			
E_g	4.1 eV	$2p^6$ – 5d, 6s trans. (Fig. 6)	73E
	3.9 eV	$2p^6$ – 5d, 6s trans. (Fig. 6)	75M
	1.12 eV	4f – 5d trans. (Fig. 6)	72W, 71G
dE_g/dp	– 4.4 meV/kbar	optical absorption (4f – 5d trans.)	69W
bulk modulus			
B_0	1070 kbar		66W
	920(60) kbar		69S
	910(80) kbar	T = 77 K	71S
	1100(50) kbar		74J
lattice Grüneisen constant			
γ_L	1.9		67A
linear thermal expansion coefficient			
α	$13.2 \cdot 10^{-6}$ K^{-1}		69L
elastic moduli			
c_{11}	$19.2 \cdot 10^{10}$ Pa	T = 78 K	69S,
c_{12}	$4.25 \cdot 10^{10}$ Pa	T = 78 K	72S2
c_{44}	$5.42 \cdot 10^{10}$ Pa	T = 78 K	
compressibility			
κ	$1.1 \cdot 10^{-11}$ Pa^{-1}		70L

sound velocity

$\upsilon_{[100]}$	$4.83(6)\cdot10^5$ cm s^{-1}	T = 78K		69S
$\upsilon_{[110]}$	$4.6(1)\cdot10^5$ cm s^{-1}	T = 78 K		

Debye temperature

Θ_D	353 K			72S2, 71P
	350 K			69S

heat capacity

C_p	48.74 J mol^{-1} K^{-1}			74M

phonon wavenumbers

$(\nu/c)_{TO}$	182 cm^{-1}		Raman scattering	74G
	199.3 cm^{-1}		IR measurement	69A
	350.1 cm^{-1}			
$(\nu/c)_{LO}$	435cm^{-1}			74G
	346.3 cm^{-1}			69A
	426.8 cm^{-1}			

dielectric constant

$\varepsilon(0)$	26.5			74G
	23.9			69A
$\varepsilon(\infty)$	4.6			74G
	5.0			69A
	3.85			68W

refractive index

n	2.25	at 4f – 5d (t_{2g}) absorption edge		71G

transition energies

E(4f – 5d)	1.12 eV	edge		72W, 71G
E(4f – 5d)	1.9 eV	maximum (Fig. 6)		71G

absorption coefficient

K	$1.23\cdot10^5$ cm^{-1}	max. 4f – 5d trans.		75S1

oscillator strength

f	0.14		oscillator strength of 4f – 5d transition	71G

width of f-d transition

W(4f – 5d)	1.1 eV		width of 4f – 5d transition	71G

photothreshold

E_{thr}	3.6 eV		ionization energy (photothreshold)	75S2
	2.7(2) eV			76M

work function

ϕ	1.8 eV			73E
	1.80(15) eV			76M

electrical conductivity, electron concentration, electron mobility, activation energy for conductivity

σ	16...50 Ω^{-1} cm^{-1}		nonactivated	73S
n	$5.5...15\cdot10^{18}$ cm^{-3}			

μ_n	20 $cm^2/V\ s$			
σ	1.6...4.5·10^3 $\Omega^{-1}\ cm^{-1}$	T = 4 K	nonactivated	73S
n	3.4...7.5·10^{19} cm^{-3}	T = 4 K	metallic phase	
μ_n	290...370 $cm^2/V\ s$	T = 4 K		
σ	50...1.4·10^{-5} $\Omega^{-1}\ cm^{-1}$			73S
E_A	0.3 eV			
n	1.9...2.9·10^{13} cm^{-3}			
μ_n	12...29 $cm^2/V\ s$			
σ	250 $\Omega^{-1}\ cm^{-1}$1	T = 4 K		73S
E_A	0.3 eV			
n	1.2...1.7·10^{19} cm^{-3}	T = 4K		
μ_n	9.2...130 $cm^2/V\ s$	T = 4 K		
ρ	4.1·10^6 Ω cm	T = 280 K		77D
E_A	0.5 eV			72O
	0.360 eV			77D
dE_A/dp	– 5 meV/kbar			72O

effective electron mass

m_n	0.42 m_0	81P

Figures and further references:

lattice parameter vs. *T*: Fig. 1

phase diagram: Fig. 2

band structure: Figs. 3, 4, 5

density of states: Fig. 6

electronic structure and mixed valence [82N, 81K]; MO-calculation [81Z]

band structure and electron-electron interaction [81F]

absorption spectrum: Fig. 7

reflectivity spectrum: Fig. 8

complex dielectric constant ε_1: Fig. 9; ε_2: Figs. 10, 14

photosensitivity: Fig. 11

temperature dependent **resistivity** and **semiconductor-metal transition**: Figs. 12, 13, pressure dependent resistivity [78D]; electric field dependence of conductivity [82G]

carrier mobility [82S]; magnetic field dependence of carrier mobility [81P]

ac-conductivity [78K]

electron-magnon interaction [81R, 82A, 83V]

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Fig. 1.

EuO. Lattice parameter vs. temperature. α is the linear coefficient of thermal expansion. The dashed line is the expected behaviour if there is no magnetic order [69L].

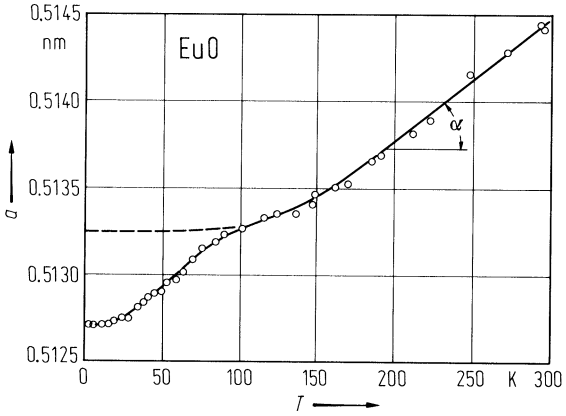

Fig. 2.

EuO, Eu_3O_4. Phase diagram of the Eu – O system. Data are obtained by reacting mixtures of Eu-metal and Eu_2O_3 in sealed tungsten or molybdenum crucibles at different temperatures [72S1].

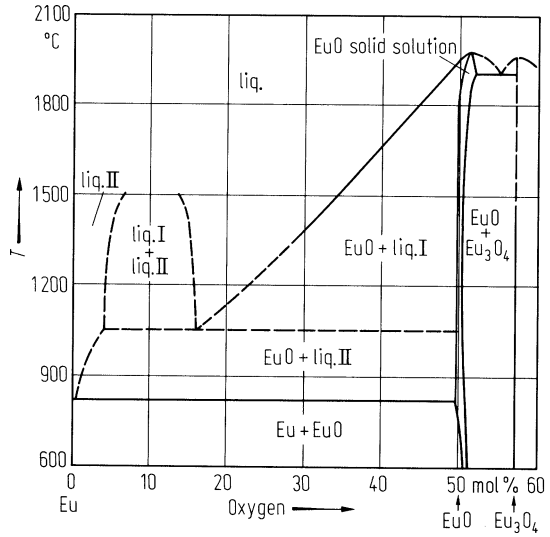

Fig. 3.

EuO. Energy bands. Solid lines for the up-spin electrons and dashed lines for the down-spin electrons [70C].

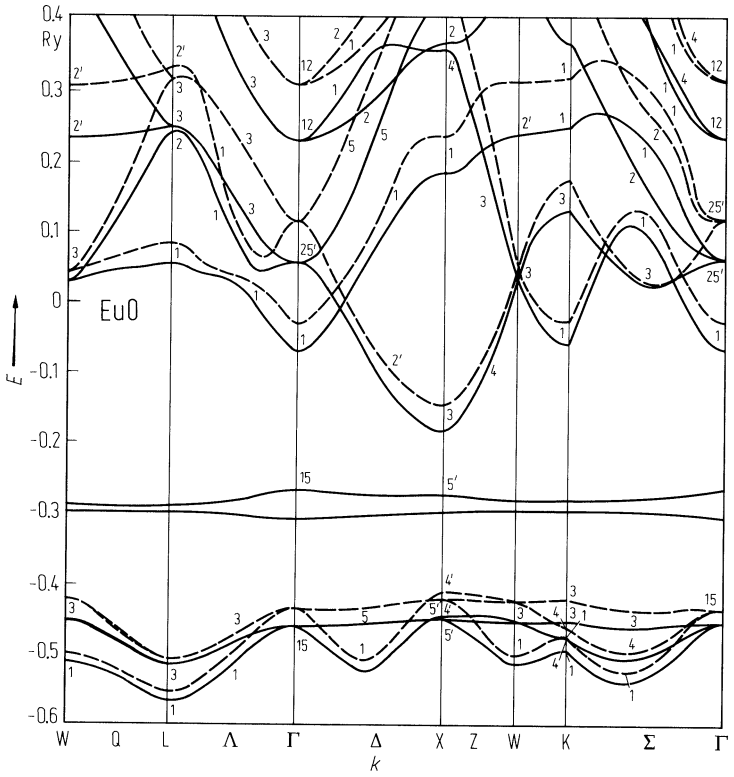

Fig. 4.

EuO. Energy bands in the k_X direction [72K].

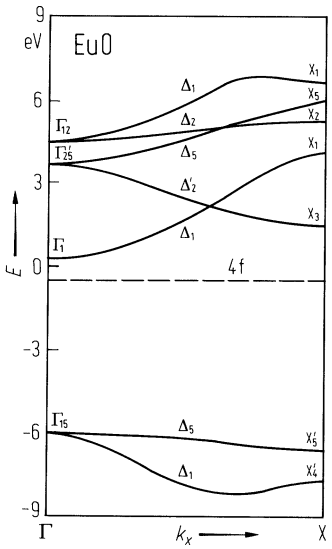

Fig. 5.

EuO. Spin-polarized energy bands, a: spin-up, b: spin-down [81F].

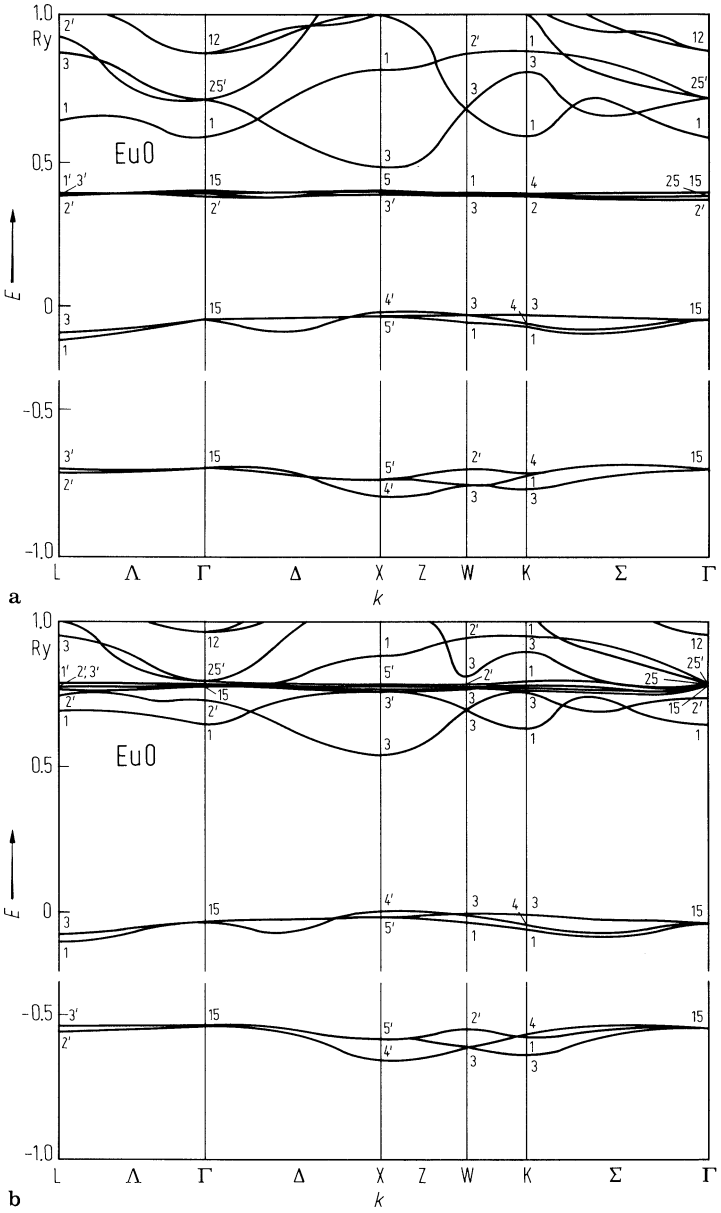

Fig. 6.

Eu-chalcogenides. Schematic density of states [79W].

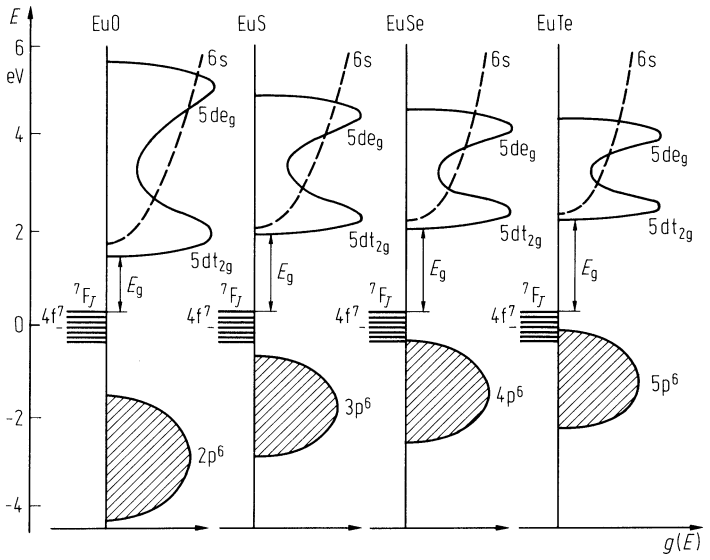

Fig. 7.

Eu-chalcogenides. Absorption coefficient vs. photon energy at 300 K, from reflectivity measurements [74G].

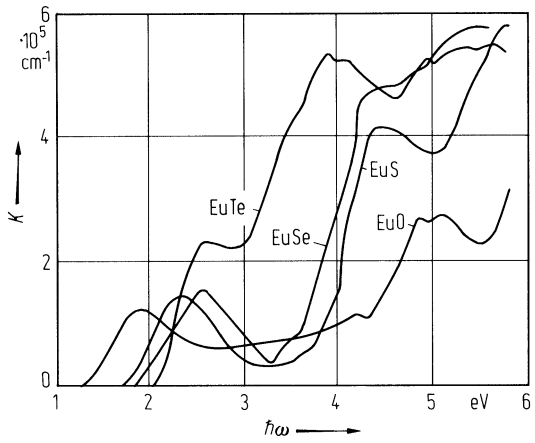

Fig. 8.

EuO. Reflectivity spectra (reflectivity vs. wavelength) of Eu-rich EuO at various temperatures vs. wavelength. Arrows point out the dips [79E].

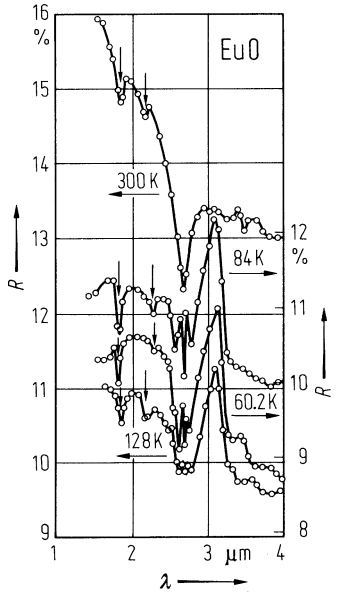

Fig. 9.

Eu-chalcogenides. Real part of the dielectric constant vs. photon energy at 300 K [74G].

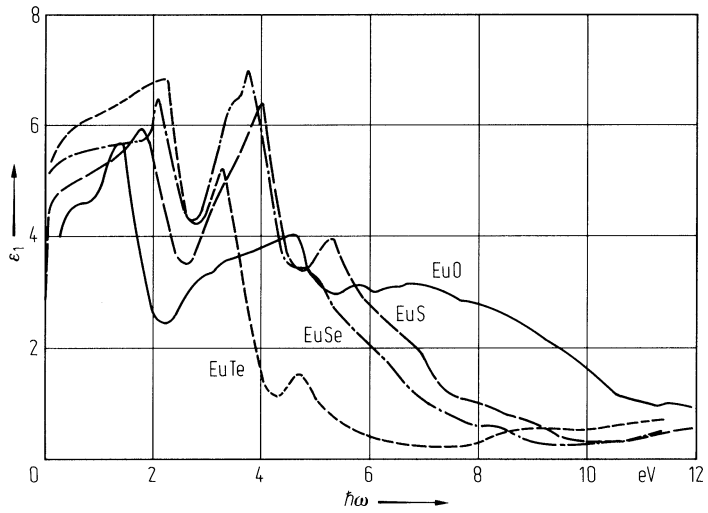

Fig. 10.

EuO. Imaginary part of the dielectric constant vs. photon energy at 300 K [74G]. Calculated transitions indicated; p denotes transition starting from the valence band.

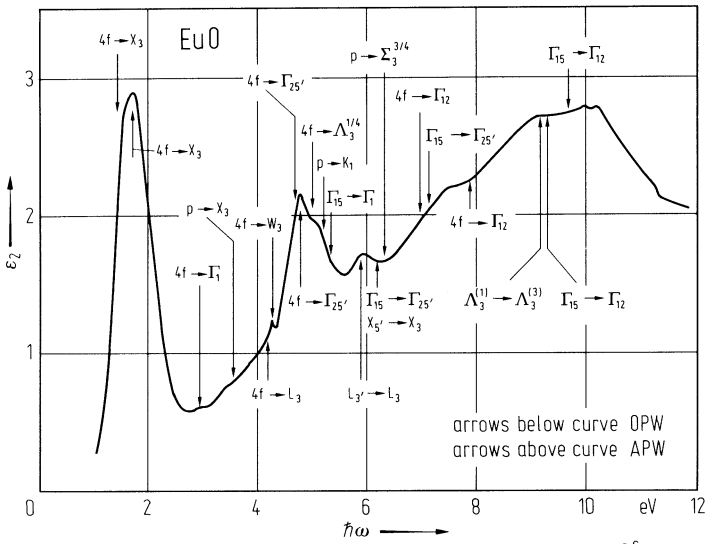

Fig. 11.

Eu-chalcogenides. Photosensitivity (photo current / light intensity) vs. temperature. The exciting wavelength is kept at the maximum of the photo-response [72W].

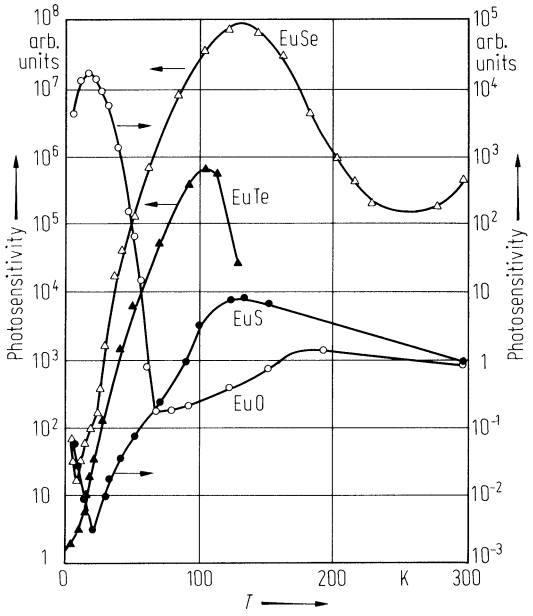

Fig. 12.

EuO. Resistivity vs. temperature for three samples [73S].

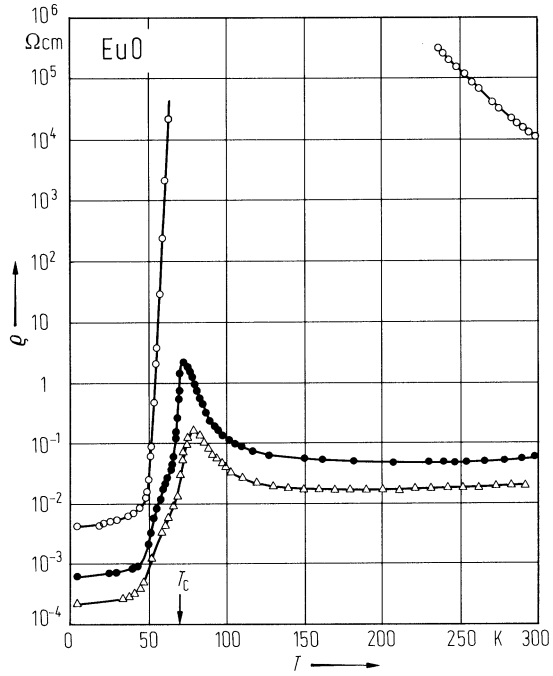

Fig. 13.

EuO. Resistivity vs. temperature [81W]. Parameter: external magnetic field.

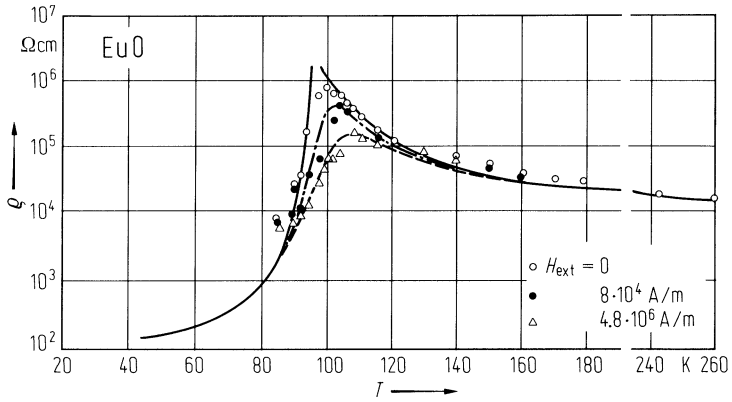

Fig. 14.

Eu-chalcogenides. Imaginary part of the dielectric constant vs. photon energy at 300 K [74G].