

**substance: SmSe**

**property: crystal structure, physical properties**

**crystal structure** cubic ( $O_h^5 - Fm3m$ )

**lattice parameters**

$a$	6.20 Å	70J
	6.1975(3) Å	76B
	6.192(4) Å	71S

**energy gap**

$E_g$	0.46(2) eV	4f–5d transition	70J
	0.55 eV	4f–5d transition	73J
	1.4(2) eV	4p <sup>6</sup> –5d, 6s trans.	74D
$dE_g/dp$	– 11 meV/kbar	opt. spectra (4f–5d transition)	72K

**bulk modulus**

$B_0$	400 kbar	72C
-------	----------	-----

**Debye temperature**

$\Theta_D$	153(14) K	77S
------------	-----------	-----

**electrical conductivity**

$\sigma$	$3 \cdot 10^{-4} \Omega^{-1} \text{ cm}^{-1}$	70J
----------	---	-----

*Figures and further references:*

**band structure:** Fig. 1

**absorption spectrum:** Fig. 2

**reflectivity spectrum:** Fig. 3

**photoemission spectrum:** Fig. 4

**photosensitivity** [73S]

pressure dependence of **resistivity:** Fig. 5

intermediate valence and **metal-semiconductor transition** [80F, 78S, 81H]

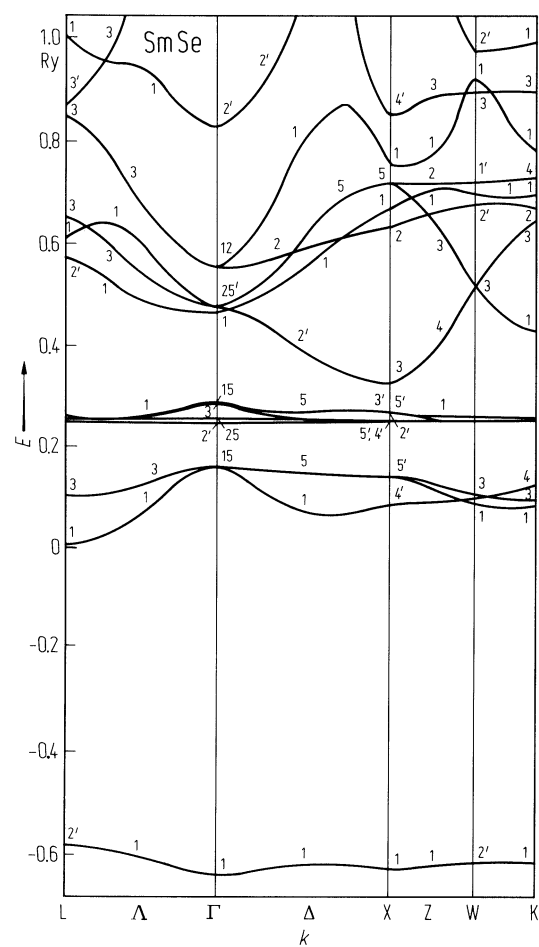
**$L\gamma_1$  emission spectra** [82T]

## References:

- 70J Jayaraman, A., Narayanamurti, V., Bucher, E., Maines, R. G.: Phys. Rev. Lett. 25 (1970) 1430.
- 71B Bucher, E., Narayanamurti, V., Jayaraman, A.: J. Appl. Phys. 42 (1971) 1741.
- 71S Suryanarayanan, R., Paparoditis, C.: Int. Conf. on Rare Earths and Actinides, Durham p. 210, 1971.
- 72C Chatterjee, A., Singh, A. K., Jayaraman, A.: Phys. Rev. B 6 (1972) 2285.
- 72K Kirk, J. L., Vedam, K., Narayanamurti, V., Jayaraman, A., Bucher, E.: Phys. Rev. B 6 (1972) 3023.
- 73J Jayaraman, A.: IV. Int. Conf. on Solid Compounds of Transition Elements, Geneva, 1973, p. 148.
- 73S Suryanarayanan, R., Paparoditis, C.: Phys. Lett. 42A (1973) 373.
- 74D Dumas, J., Schlenker, C.: Phys. Status Solidi (a) 22 (1974) 89.
- 76B Batlogg, B., Kaldis, E., Schlegel, A., Wachter, P.: Phys. Rev. B 14 (1976) 5503.
- 76C Campagna, M., Wertheim, G. K., Bucher, E.: In Structure and Bonding, Vol. 30, Springer: Berlin 1976.
- 76G Günterodt, G.: In Festkörperprobleme XVI, Advances in Solid State Physics, Treusch, J. (ed.), Braunschweig: Vieweg 1976.
- 77S Subhadra, K. G., Sirdeshmukh, D. B.: Pramana 9 (1977) 223.
- 78S Smirnov, I. A., Oskotskii, V. S.: Sov. Phys. Usp. 21 (2) (1978) 117.
- 80F Farberovich, O. V.: Sov. Phys. Solid State 22 (3) (1980) 393.
- 81H Holtzberg, F., Wittig, J.: Solid State Commun. 40 (1981) 315.
- 82T Tsutsumi, K., Aita, O., Watanabe, T.: Phys. Rev. B 25 (1982) 5415.

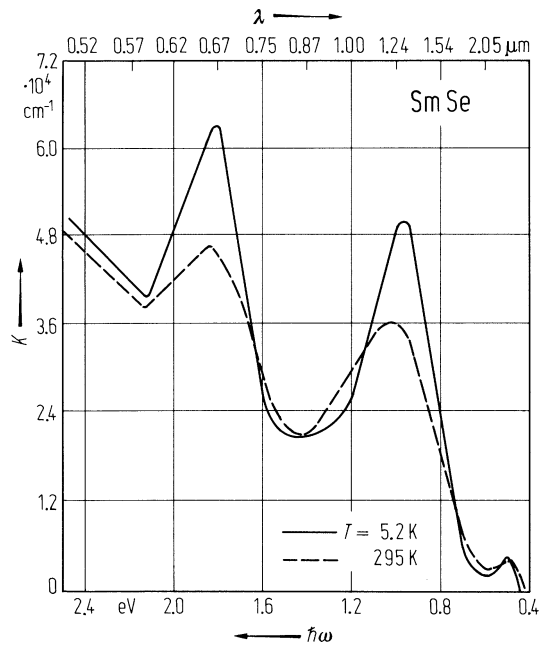
**Fig. 1.**

SmSe. Band structure [80F].



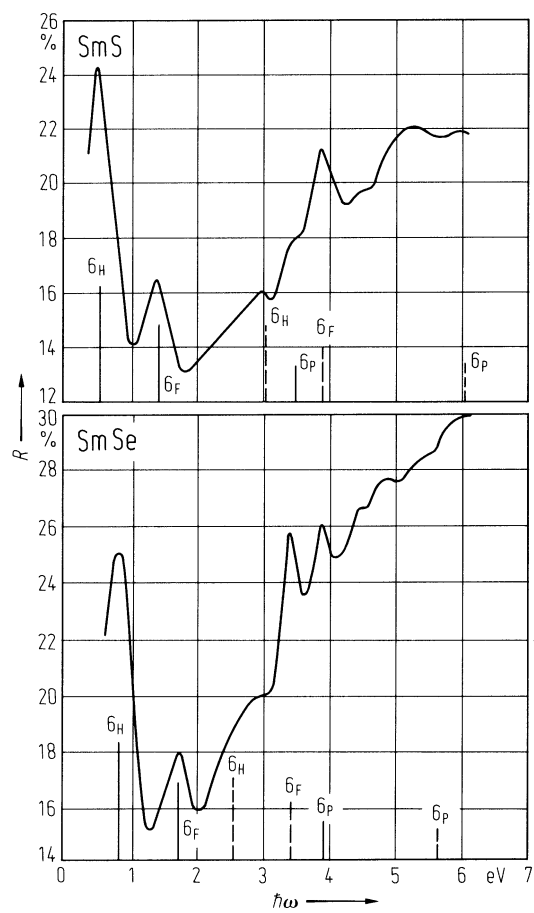
**Fig. 2.**

SmSe. Optical absorption coefficient vs. photon energy for films of 8000 Å thickness [71B].



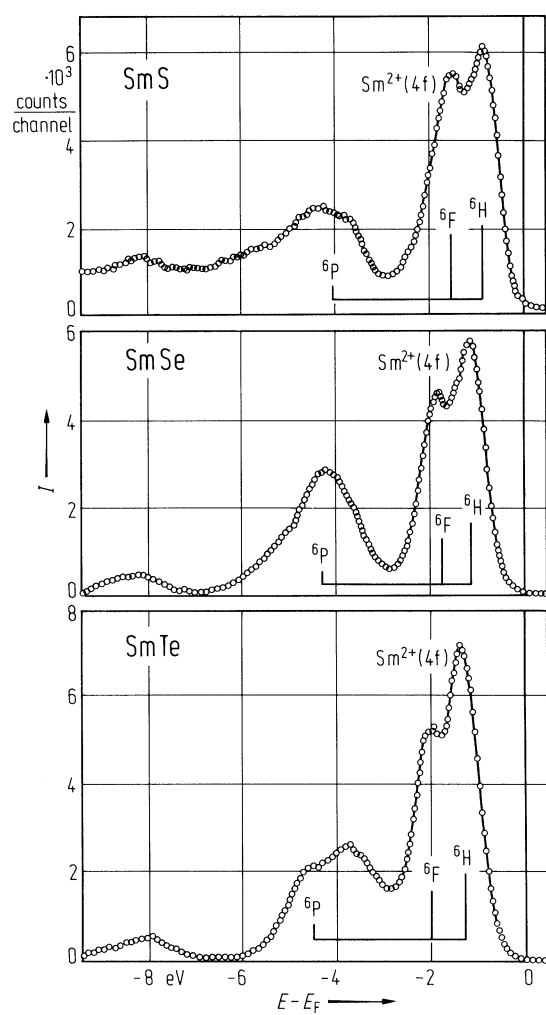
**Fig. 3.**

SmS, SmSe. Reflectivity vs. photon energy for cleaved single crystals at 300 K. (—) 5d ( $t_{2g}$ ) and (---) 5d ( $e_g$ ) final states [76G].



**Fig. 4.**

SmS, SmSe, SmTe. XPS spectra of the valence band and the 4f region (electron intensity vs. binding energy) [76C].



**Fig. 5.**

SmS, SmSe, SmTe. Normalized resistivity vs. pressure for SmS. The actual resistivity at pressures greater than 6.5 kbar is  $\approx 3 \dots 4 \cdot 10^{-4} \Omega \text{ cm}$ . The data for SmSe and SmTe are shown in the inset [70J].

