substance: hematite (α-Fe_2O_3)
property: optical properties, dielectric constants

optical spectra: He II and XPE: Fig. 1, absorption near edge: Fig. 2, far UV and visible spectrum: Fig. 3. For data on peak energies in these spectra, see document .

He II, XPE: straight forward interpretation not possible; configuration interaction gives rise to a very broad valence band due to Fe 3d ionization [77B].

Resonant Raman two-magnon scattering in Fe_2O_3 shows a strong maximum as the exciting laser line is scanned through 2.2 eV, supporting the $^6A_{1g} \rightarrow {}^4T_{2g}$ assignment for this transition; however, the overall intensity of absorption at 2.2 eV is too strong for a spin-forbidden transition, and a broad indirect absorption maximum with a threshold at 1.88 eV [79K]] has been suggested – this process has been assigned to charge transfer [78M].

dielectric constants

(see also Fig. 3)

$\varepsilon(0)$	20.6	RT, $E \parallel c$	from A_{2u} modes	77O
	24.1	$E \perp c$	from E_u modes	
$\varepsilon(\infty)$	6.7	RT, $E \parallel c$	from A_{2u} modes	77O
	7.0	$E \perp c$	from E_u modes	

References:

77B Brundle, C. R., Chuang, T. J., Wandelt, K.: Surf. Sci. 68 (1977) 459.
77O Onari, S., Arai, T., Kudo, K.: Phys. Rev. B16 (1977) 1717.
78B Balberg, I., Pinch, H. L.: J. Mag. Magn. Mater. 7 (1978) 12.
78M Merlin, R., Martin, T. P., Polian, A., Cardona, M., Audlemer, B., Tannhauser, D.: J. Mag. Magn. Mater. 9 (1978) 83.
79G Galuza, A. I., Eremenko, V. V., Kirichenko, A. P.: Fiz. Tverd Tela 21 (1979) 1125.
79K Koffyberg, F. P., Dwight, K., Wold, A.: Solid State Commun. 30 (1979) 433.
79V Vasudevan, S., Hedge, M. S., Rao, C. N. R.: J. Solid State Chem. 29 (1979) 253.

Fig. 1.

Fe_2O_3, FeO, Fe_3O_4. (a) He II and (b) AlK_α XPE spectra (intensity vs. electron binding energy) showing valence bands in various iron oxides [79V].

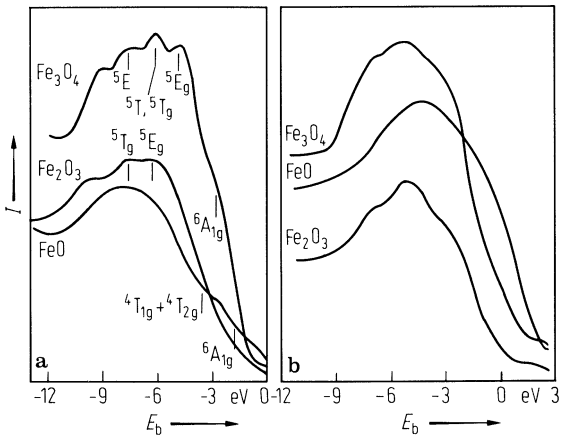

Fig. 2.

Fe_2O_3. Absorption coefficient vs. photon energy for samples of varying thickness; CVD: chemically vapour deposited, VT: vapour transport grown [78B].

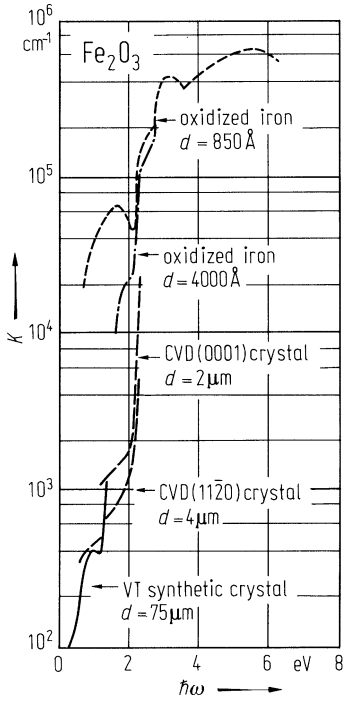

Fig. 3.

Fe_2O_3. Reflectance (R) and real and imaginary parts of the dielectric function vs. wavelength (photon energy) [79G].