

substance: FeO (Fe_{1-x}O)

property: optical properties, dielectric constant

optical properties

Photoemission spectrum: Fig. 1, absorption spectra: Figs. 2, 3.

Detailed interpretation of the PE spectrum is complicated by final-state effects [75E, 77B, 79V, 80G] and a detailed calculation [77B, 80G] and comparison with XPS suggests that the Fe 3d emission is far broader than had earlier been suggested (Fig. 1); this result is essentially traceable to extensive excited state configuration interaction.

The rather ill-defined structure in the absorption spectrum is assigned to Fe 3d – Fe 4s transitions [78B], but earlier work [74B] has shown that absorption in this region was strongly dependent on the degree of non-stoichiometry (Fig. 2). Above 2.4 eV, the absorption rises strongly, and this edge has also been ascribed to a d–s transition.

dielectric constants

$\epsilon(0)$	24	RT	from IR reflectivity	77P
	31.4	RT	from dispersion spectrum	77K
$\epsilon(\infty)$	11.13	RT		77P
	9.24	RT		77K

lattice parameters in fitting of the dielectric function

(RT values)

$$\epsilon(\omega) = \epsilon(\infty) + 4\pi\rho_0(\nu/c)_0^2/((\nu/c)_0^2 - (\nu/c)^2 - i\gamma_0(\nu/c)) - \epsilon(\infty)(\nu/c)_p^2/((\nu/c)^2 + i(\nu/c)/\tau)$$

$(\nu/c)_0$	337.28 cm ⁻¹	77P
$(\nu/c)_p$	265.94 cm ⁻¹	
γ_0	96.80 cm ⁻¹	
$4\pi\rho_0$	12.94	
τ^{-1}	143·10 ¹² Hz	

References:

- 74B Bowen, H. K., Adler, D., Auken, B. H.: J. Solid State Chem. 12 (1975) 355.
75E Eastman, D. E., Freeouf, J. L.: Phys. Rev. Lett. 34 (1975) 395.
77B Bagus, P. S., Brundle, C. R., Chuang, T. J., Wandelt, K.: Phys. Rev. Lett. 39 (1977) 1229.
77K Kugel, G., Carabatos, C., Hennion, B., Prevot, B., Reviolevschi, A., Tocchetti, D.: Phys. Rev. B16 (1977) 378.
77P Prevot, B., Briellman, J., Meftah, M. P., Sieskind, M.: Phys. Status Solidi (a) 40 (1977) 503.
78B Balberg, I., Pinch, H. L.: J. Magn. Magn. Mater. 7 (1978) 12.
79V Vasudevan, S., Hegde, M. S., Rao, C. N. R.: J. Solid State Chem. 29 (1979) 253.
80G Grenet, G., Jugnet, Y., Duc, T. M., Kilder, M.: J. Chem. Phys. 72 (1980) 218.

Fig. 1.

Fe_{1-x}O Photoemission spectrum (intensity vs. electron binding energy) in the valence band region. (a) XPS spectrum [77B], (b) UPS spectrum, $h\nu = 30$ eV, (c) UPS spectrum, $h\nu = 20$ eV [75E]. Figure from [77B]. (d) (i) HeI (21.2 eV), (ii) He II (40.8 eV) and (iii) Mg $K\alpha$ (1253.6 eV) photoemission spectra for $\text{Fe}_{0.946}\text{O}$, peaks 1, 2 and 4 are assigned to Fe 3d and 3 to O 2p. E_b : binding energy relative to photoemission onset [77B].

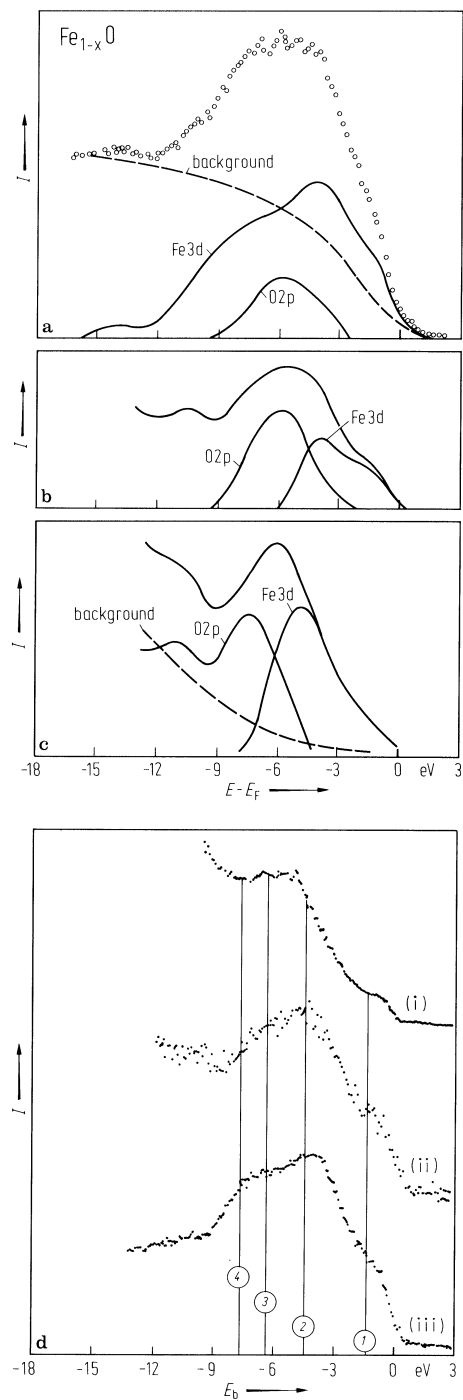


Fig. 2.

$\text{Fe}_{0.94}\text{O}$. Absorption coefficient of a 3 μm thick film on MgO vs. photon energy at two temperatures [78B].

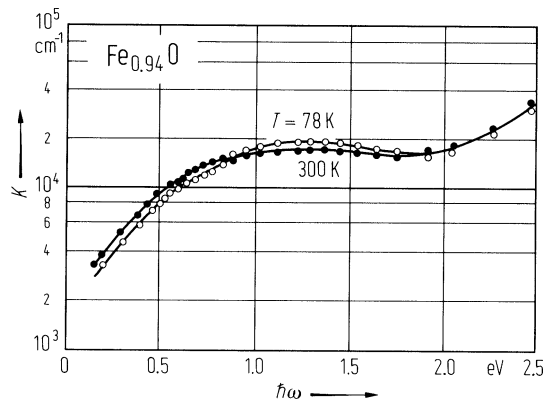


Fig. 3.

Fe_{1-x}O . Absorption coefficient vs. wavelength at RT for single crystalline films of different composition [74B].

