

substance: Fe₃O₄

property: optical properties, dielectric constants

optical spectra: UPS-spectra; Figs. 1...3; absorption coefficient: Figs. 4, 5

The maximum in the absorption coefficient at 0.72(2) eV has been interpreted in terms of small polaron theory [74M], band-to-band transitions [71B, 72B, 75B] or d – s charge transfer [79S]. Only slight changes in absorption coefficient occur at the Verwey transition (Fig. 7). Most important is the apparent formation of a small optical gap of $E_g \approx 0.12$ eV [72B].

dielectric constant: real and imaginary parts of the dielectric constant: Fig. 6, 7; dielectric constant in the microwave region: Fig. 8. See also [77K, 79S, 74M, 72B, 71B].

References:

- 71B Balberg, I., Pankove, J. I.: Phys. Rev. Lett. 27 (1971) 596.
- 72B Buchenau, U., Müller, I.: Solid State Commun. 11 (1972) 1291.
- 74M Muret, P.: Solid State Commun. 14 (1974) 1119.
- 75B Buchenau, U., Müller, I.: Physica 80B (1975) 75.
- 76A Alvarado, S. F., Erbudak, M., Munz, P.: Phys. Rev. B14 (1976) 2740.
- 77K Kuipers, A. J. M., Brabers, V. A. M.: Phys. Rev. Lett. 39 (1977) 488.
- 78M Mizushima, K., Nakao, K., Tanaka, S., Iida, S.: J. Phys. Soc. Jpn. 44 (1978) 1831.
- 79S Schlegel, A., Alvarado, S. F., Wachter, P.: J. Phys. C12 (1979) 1157.

Fig. 1.

Fe_3O_4 . Photoemission spectrum (intensity vs. electron binding energy) showing 3d emission as observed with synchrotron radiation (FUPS), with ultra-violet light (UPS) and as calculated with the single-ion-in-a-crystal-field (SICF) model [76A].

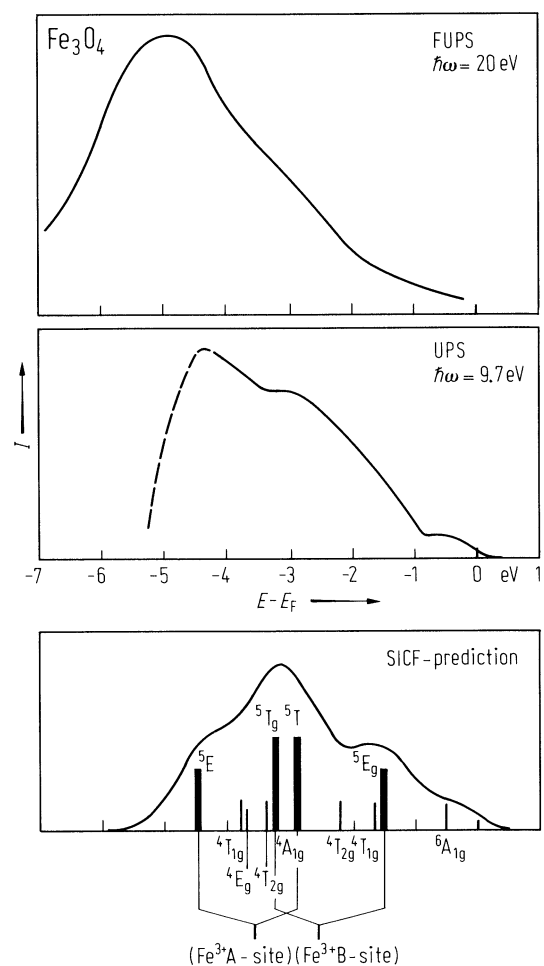


Fig. 2.

Fe_3O_4 . Photoemission spectrum (intensity vs. electron binding energy) at two photon energies at 300 K. ----- inelastic background, ---- O 2p band, — total energy distribution curves (EDC) and Fe 3d curve [76A].

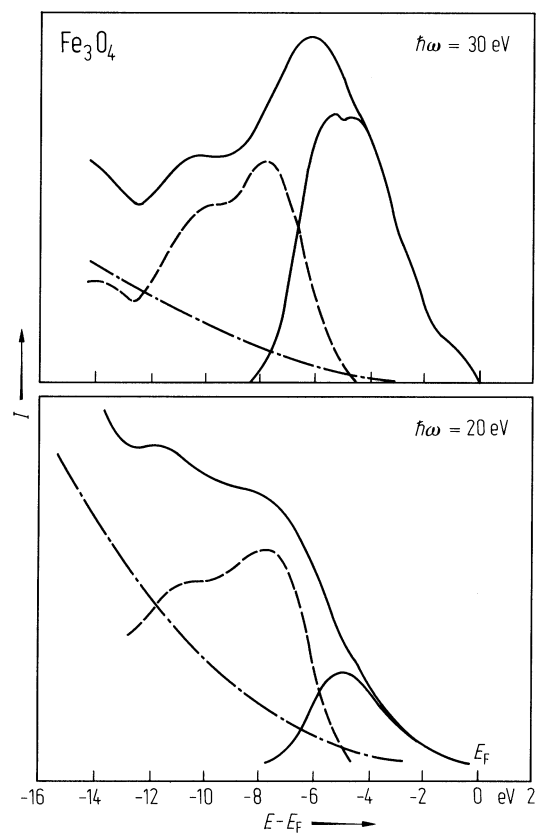


Fig. 3.

Fe_3O_4 . Photoelectron spin polarization P vs. photon energy at 200 K. Lower curve: SICF prediction [76A].

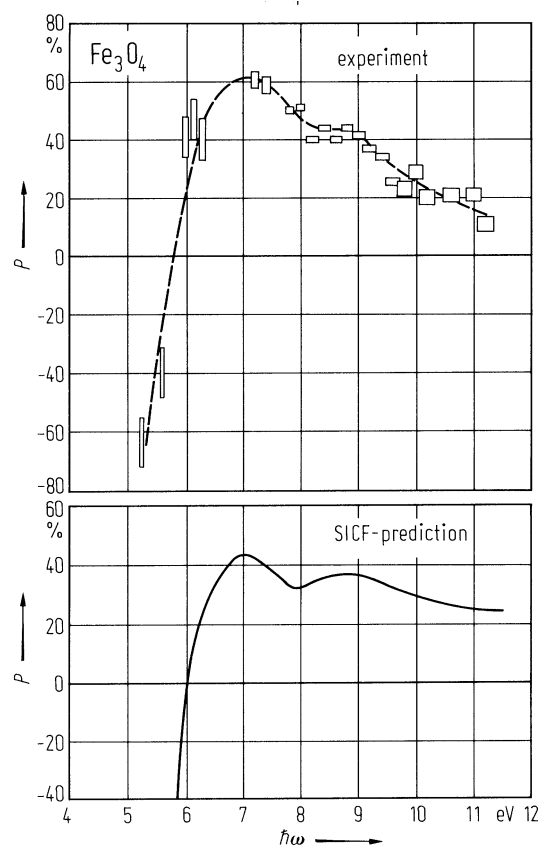


Fig. 4.

Fe_3O_4 . Absorption coefficient vs. photon energy in the UV at 300 K [79S].

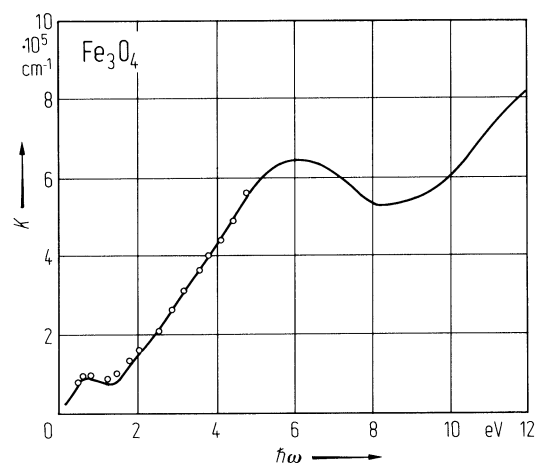


Fig. 5.

Fe_3O_4 . Absorption coefficient at RT vs. photon energy in the visible region for thin magnetite films [74M].

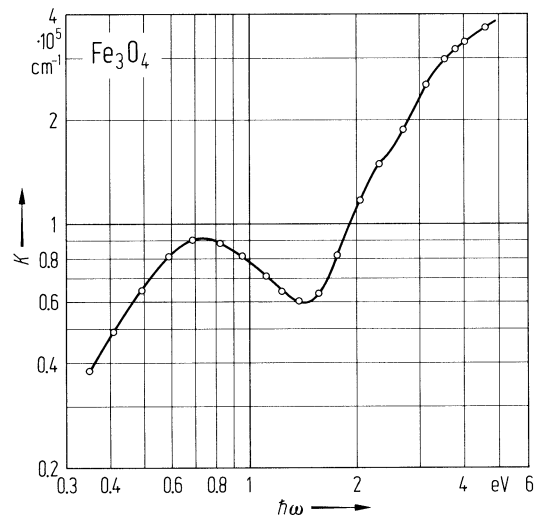


Fig. 6.

Fe_3O_4 . Real and imaginary parts of the dielectric function at 300 K vs. photon energy [79S].

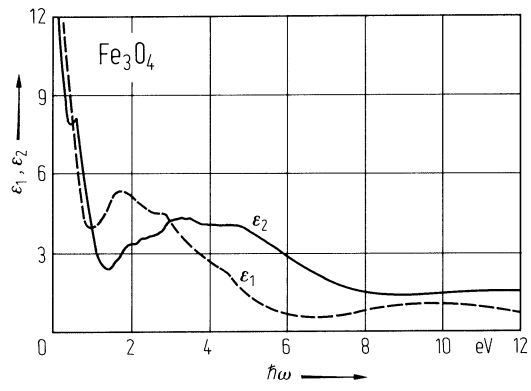


Fig. 7.

Fe_3O_4 . (a) Optical dielectric constant and (b) optical conductivity vs. photon energy at 77 K and 293 K; (c, d) optical conductivity vs. temperature for photon energy = 0.6 and 0.13 eV, respectively [72B].

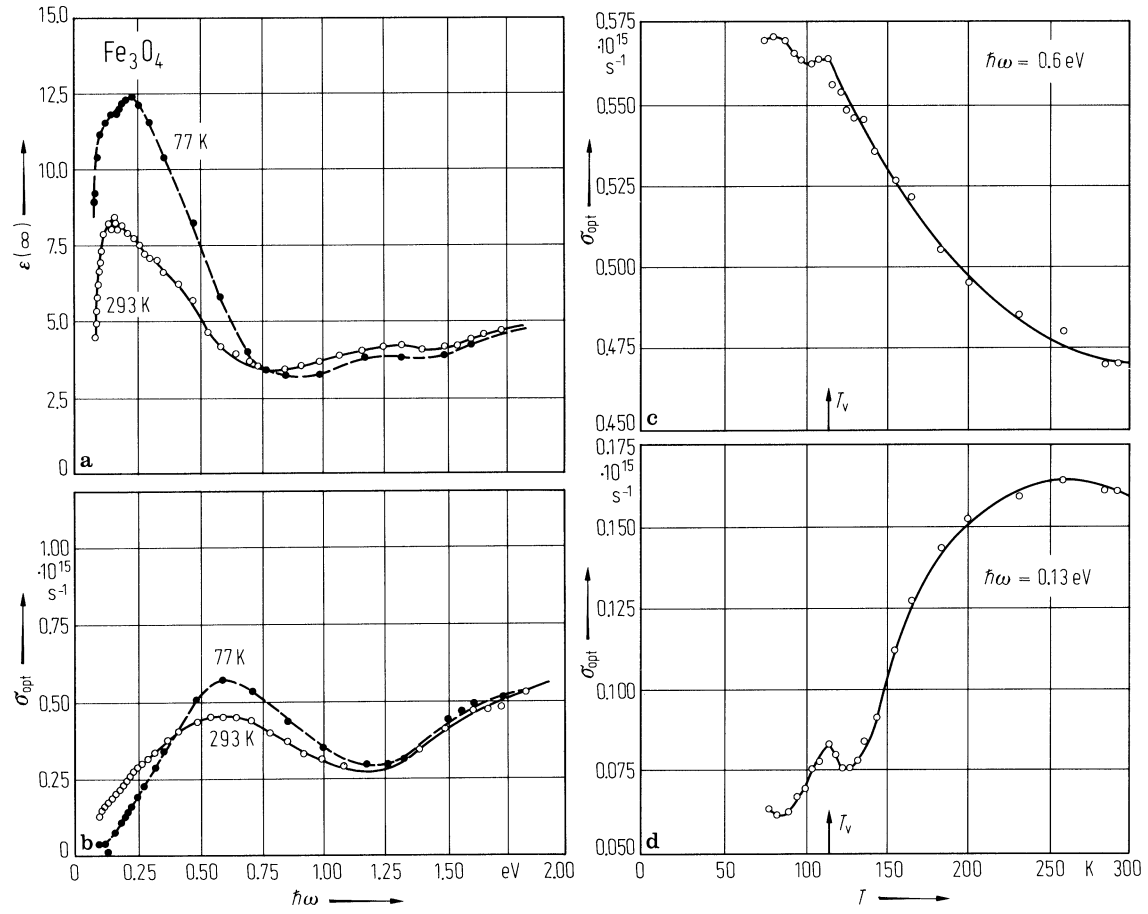


Fig. 8.

Fe_3O_4 . Dielectric constant vs. temperature in the microwave region for the low-temperature phase [78M].

