substance: CoO
property: optical properties, dielectric constants

optical spectra: photoemission: Figs. 1, 4, 5, absorption: Fig. 2, thermoreflectance: Fig. 3.

The photoemission spectrum has been interpreted in terms of a localized model involving a large number of final states. High-resolution XPS data [72W, 73H, 75K, 76H, 79J] show d-state photoemission to occur over ≈ 12 eV, a result supported by calculation (Figs. 4, 5). The long d-energy spread in Fig. 1 is attributed to extensive ground-state configuration mixing. An upper limit of 3 eV for the Co 3 d band width can be assigned and an upper limit of ≈ 3 eV to the process 2 Co^{2+} ($3d^7$) → Co^{3+} ($3d^6$) + Co^{+} ($3d^8$). Satellite structure in the core region of the XPS spectrum: 6 eV wide structure at 9.8 eV ascribed to O 2p (e_g) → Co 3d (e_g) charge transfer as are peaks ≈ 6 eV below the main Co 2s, 2p, 3d and (?) 3s, 3p signals [75K]. Below the band threshold of 470 nm (2.64 eV) transitions are excitonic d – d in nature; detailed assignments [59P].

dielectric constants

$\varepsilon(0)$	22.50	T = 295 K	IR reflectance fit	69P
	13	T = 295 K	IR reflectance fit	65G
	10.70	T = 425 K	neutron scattering data	68S
	12.73	T = 110 K		
	12.19	T = 296 K		
$\varepsilon(\infty)$	4.95	T = 295 K		69P
	5.76	T = 295 K		65R
	5.3	T = 295 K		65G
	5.4	T = 295 K		59N
	5.19	T = 425 K		68S
	5.28	T = 110 K		
	5.3	T = 296 K		

For real and imaginary parts of the dielectric function vs. photon energy, see Fig. 2.

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Fig. 1.

CoO. XPS spectrum in the core region (intensity vs. binding energy) [75K]. For assignment of various peaks, see original paper. E_b: binding energy relative to the Fermi level.

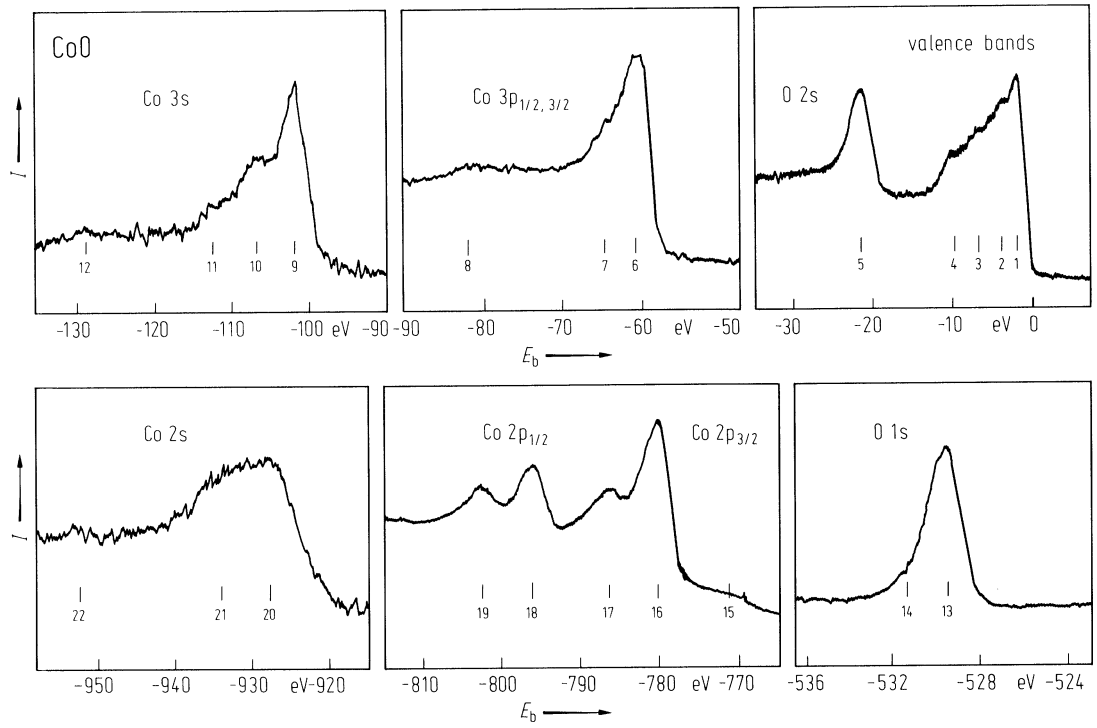

Fig. 2.

CoO. (a) Real and imaginary parts of the dielectric function vs. photon energy, (b) absorption coefficient vs. photon energy at RT [70P].

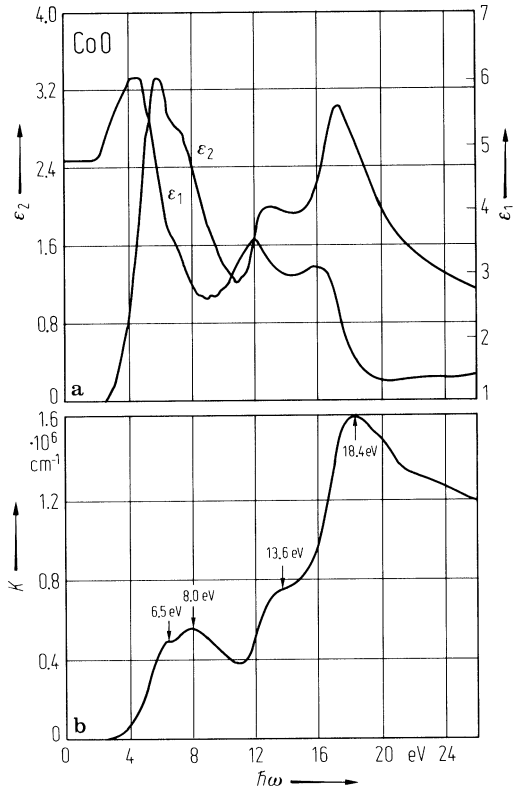

Fig. 3.

CoO. Thermoreflectance vs. photon energy at various temperatures [72M].

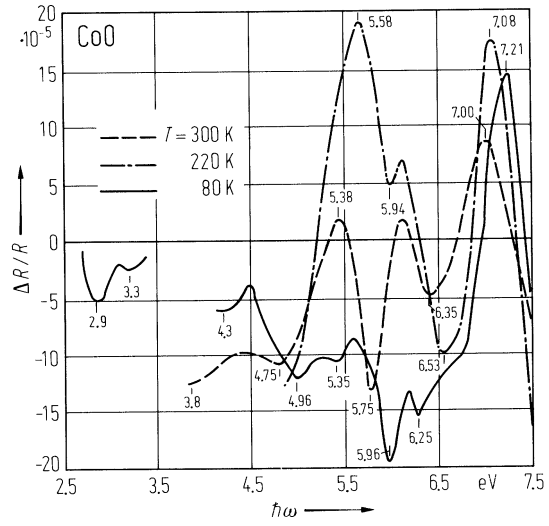

Fig. 4.

CoO. Valence band spectra (intensity vs. electron binding energy at various excitation energies) [79J].

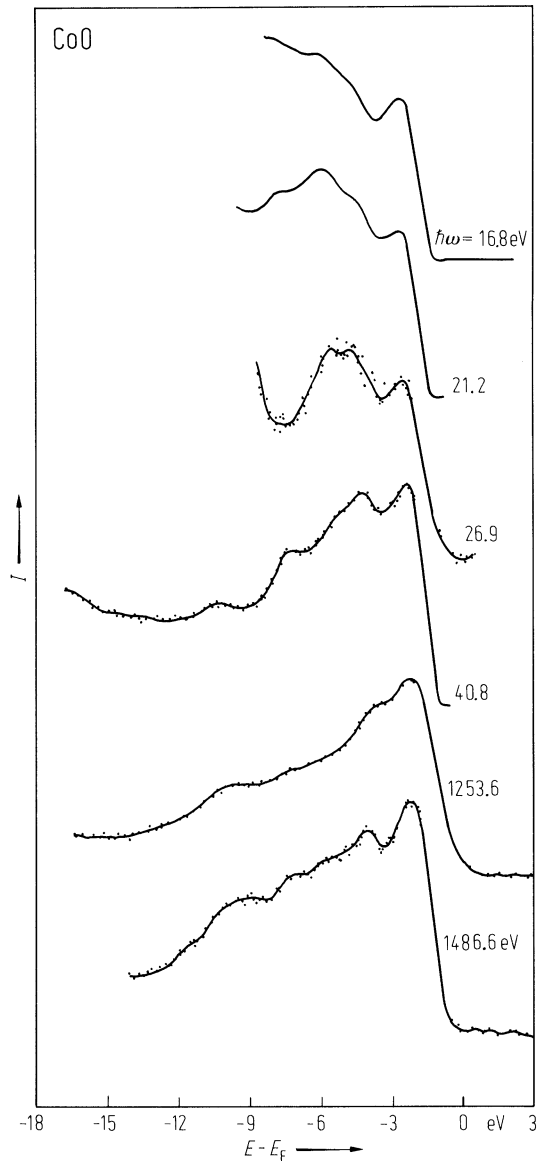

Fig. 5.

CoO. Valence band XPS spectrum (intensity vs. electron binding energy) *a* experimental spectrum (after subtraction of background), *b* calculated spectrum after convoluting each expected d-excitation with a 1.8 eV Gaussian, *c* difference between *a* and *b* [79J].