

Contents

Physics of solid surfaces

Subvolume d: Interaction of radiation with surfaces and electron tunneling

1	General introduction (G. CHIAROTTI)	1
1.1	Motivations for a Landolt-Börnstein volume on surface physics	1
1.2	Outline of the volume	2
1.3	How to consult the volume	12
1.4	List of frequently used symbols and abbreviations	13
1.5	Conversion tables	20
1.6	Crystal structures and bulk lattice parameters of materials quoted in the volume	21
1.7	References for 1	27
2	The structure of surfaces	see subvolume III/24a
3	Electronic structure of surfaces	see subvolume III/24b
4	Vibrational and excitational properties of surfaces	see subvolume III/24b
5	Magnetic properties of single crystal surfaces	see subvolume III/24b
6	Interaction of charged particles with surfaces	see subvolume III/24c
7	Interaction of atoms with surfaces	see subvolume III/24c
8	Interaction of electromagnetic radiation with surfaces	29
8.1	Optical properties of surfaces (P. CHIARADIA)	29
8.1.1	Introduction	29
8.1.1.1	Preliminary remarks	29
8.1.1.2	Differential reflection	29
8.1.1.3	Surface ellipsometry	32
8.1.1.4	Surface photoconductivity	34
8.1.1.5	Surface photovoltage spectroscopy	34
8.1.1.6	Photothermal displacement spectroscopy	35
8.1.1.7	Surface photoluminescence	36
8.1.1.8	Surface second-harmonic generation	36
8.1.2	Data	36
8.1.2.1	Metals	36
8.1.2.2	Semiconductors	38
8.1.2.2.1	Covalent semiconductors	38
8.1.2.2.2	III-V compounds	53
8.1.2.2.3	ZnO (1 $\bar{1}$ 00)	66

8.1.3	Appendix	67
8.1.4	References for 8.1	68
8.2	Photoemission and inverse photoemission (A.M. BRADSHAW, R. HEMMEN, D.E. RICKEN, Th. SCHEDEL-NIEDRIG)	70
8.2.1	Introduction	70
8.2.2	Data	76
8.2.2.1	Metals	77
8.2.2.1.1	Group IA (alkali metals); Li, Na, K, Rh, Cs	77
8.2.2.1.2	Group IIA (alkaline earth metals); Be, Mg	86
8.2.2.1.3	Group IIIA; Al	100
8.2.2.1.4	Group IIIB; Sc, Y, Lanthanides	112
8.2.2.1.5	Group IVB; Ti	124
8.2.2.1.6	Group VB; Nb, Ta	127
8.2.2.1.7	Group VIB; Cr, Mo, W	137
8.2.2.1.8	Group VIIB; Re	161
8.2.2.1.9	Group VIII; Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt	162
8.2.2.1.10	Group IB (noble metals); Cu, Ag, Au	195
8.2.2.1.11	Group VA; Bi	227
8.2.2.2	Semiconductors	231
8.2.2.2.1	Group IVA semiconductors; C, Si, Ge	231
8.2.2.2.2	Semiconducting Zn compounds; ZnO, ZnS, ZnSe	261
8.2.2.2.3	II-VI compounds; CdS, CdSe, CdTe	265
8.2.2.2.4	III-V compounds; GaP, GaAs, GaSb, InP, InAs, InSb	276
8.2.3	References for 8.2	299
8.3	X-ray diffraction of surface structures (R. COLELLA)	312
8.3.1	Introduction	312
8.3.1.1	Preliminary remarks	312
8.3.1.2	General principles. Early experimental results	313
8.3.1.3	In Plane Diffraction (IPD)	317
8.3.1.4	Truncation Rod Scattering (TRS)	318
8.3.1.5	Standing waves	320
8.3.2	Data	323
8.3.3	References for 8.3	340
9	Electron tunneling at surfaces	342
9.1	Field emission, field ionization, and field desorption (G.L. KELLOGG)	342
9.1.1	Introduction	342
9.1.1.1	General layout.	342
9.1.1.2	Field electron emission	343
9.1.1.2.1	Theory of field electron emission	343
9.1.1.2.2	Field emission microscopy	344
9.1.1.2.3	Applications of field electron emission	344
9.1.1.3	Field ion emission	346
9.1.1.3.1	Theory of field ionization	346
9.1.1.3.2	Field ion microscopy	347
9.1.1.3.3	Applications of field ionization	348
9.1.1.4	Field desorption	348
9.1.1.4.1	Theory of field desorption	348
9.1.1.4.2	Atom-probe mass spectroscopy	350
9.1.1.4.3	Applications of field desorption	351
9.1.2	Data	352
9.1.3	References for 9.1	359

9.2	Scanning tunneling microscopy (STM) (R.J. HAMERS)	363
9.2.1	Introduction	363
9.2.1.1	Principles and experimental implementation of STM	363
9.2.1.2	Interpretation of STM images	364
9.2.1.3	Electron structure effects	366
9.2.1.4	Tunneling spectroscopy	368
9.2.1.5	Limitations and continued development of STM	371
9.2.2	Data	372
9.2.2.1	Metals	372
9.2.2.2	Semiconductors	374
9.2.3	References for 9.2	398
10	General index (compiled by C. GOLETTI)	403

