

Bibliography

- [Bai88] Ch. Bai, *Scanning tunneling microscopy and its application*, Springer-Verlag, Berlin Heidelberg New York, 1988.
- [Bar61] J. Bardeen, *Tunneling from a many-particle point of view*, Physical Review Letters **6** (1961), 57–59.
- [Bau58] E. Bauer, *Phänomenologische Theorie der Kristallabscheidung an Oberflächen*, Zeitschrift für Kristallographie **110** (1958), 372 – 431.
- [BBB⁺99] R. Bennewitz, V. Barwich, M. Bammerlin, C. Loppacher, M. Guggisberg, A. Baratoﬀ, E. Meyer, and H.-J. Güntherodt, *Ultrathin films of NaCl on Cu(111): a LEED and dynamic force microscopy study*, Surface Science **438** (1999), 289 – 296.
- [Ben61] G.C. Benson, *Recalculation of the surface energies of alkali halide crystals*, The Journal of Chemical Physics **35** (1961), 2113 – 2116.
- [BMOS01] A.R. Bachmann, A. Mugarza, J.E. Ortega, and S. Speller, *One-dimensional Ag-Cu superlattices on vicinal Cu(111)*, Physical Review B **64** (2001), 153409–1 – 153409–4.
- [BMR99] L. Bartels, G. Meyer, and K.-H. Rieder, *The evolution of CO adsorption on Cu(111) as studied with bare and CO-functionalized scanning tunneling tips*, Surface Science **432** (1999), L621 – L626.
- [BR02] K.-F. Braun and K.-H. Rieder, *Engineering electronic lifetimes in artificial atomic structures*, Physical Review Letters **88** (2002), 096801–1 – 096801–4.
- [Bra01] K.-F. Braun, *Oberflächenuntersuchungen und atomare Manipulation mit einem Rastertunnelmikroskop bei tiefen Temperaturen*, Ph.D. thesis, Freie Universität Berlin, 2001.

- [BRGW82a] G. Binnig, H. Rohrer, Ch. Gerber, and E. Weibel, *Surface studies by scanning tunneling microscopy*, Physical Review Letters **49** (1982), 57 – 61.
- [BRGW82b] G. Binnig, H. Rohrer, Ch. Gerber, and E. Weibel, *Tunneling through a controllable vacuum gap*, Applied Physics Letters **40** (1982), 178 – 180.
- [Bur82] J.K. Burdett, *Predictions of the structure of complex solids*, Advances in Chemical Physics **49** (1982), 47 – 113.
- [CEKL75] H. Conrad, G. Ertl, J. Küppers, and E.E. Latta, *Photoelectron spectroscopy from CO adsorbed on a Cu(111) surface*, Solid State Communications **17** (1975), 613 – 616.
- [Cla85] L.J. Clarke, *Surface crystallography – an introduction to Low Energy Electron Diffraction*, John Wiley & Sons, 1985.
- [CLE93] M.F. Crommie, C.P. Lutz, and D.M. Eigler, *Imaging standing waves in a two-dimensional electron gas*, Nature **363** (1993), 524 – 527.
- [CLEH96] M.F. Crommie, C.P. Lutz, D.M. Eigler, and E.J. Heller, *Quantum interference in 2D atomic-scale structures*, Surface Science **361/362** (1996), 864 – 869.
- [EK85] G. Ertl and J. Küppers, *Low Energy Electrons and Surface Chemistry*, VCH Verlagsgesellschaft, Weinheim, 1985.
- [ES90] D.M. Eigler and E.K. Schweizer, *Positioning single atoms with a scanning tunneling microscope*, Nature **344** (1990), 524 – 526.
- [FBH89] S. Fölsch, U. Barjenbruch, and M. Henzler, *Atomically thin epitaxial films of NaCl on Germanium*, Thin Solid Films **172** (1989), 123 – 132.
- [FHR⁺02] S. Fölsch, A. Helms, A. Riemann, J. Repp, G. Meyer, and K.H. Rieder, *Nanoscale surface patterning by adsorbate-induced faceting and selective growth: NaCl on Cu(211)*, Surface Science **497** (2002), 113 – 126.
- [FHZ⁺00] S. Fölsch, A. Helms, S. Zöphel, J. Repp, G. Meyer, and K.H. Rieder, *Self-organized patterning of an insulator-on-metal system by surface faceting and selective growth: NaCl/Cu(211)*, Physical Review Letters **84** (2000), 123 – 126.
- [Hen77] M. Henzler, *Electron diffraction and surface defect structure*, Electron Spectroscopy for Surface Analysis (H. Ibach, ed.), Springer-Verlag, Berlin Heidelberg New York, 1977.

- [Hen78] M. Henzler, *Quantitative evaluation of random distributed steps at interfaces and surfaces*, Surface Science **73** (1978), 240 – 251.
- [Hen84] M. Henzler, *Measurement of surface defects by Low-Energy Electron Diffraction*, Applied Physics A **34** (1984), 205 – 214.
- [Hen93] M. Henzler, *Growth modes in homo- and heteroepitaxial growth*, Progress in Surface Science **42** (1993), 297 – 316.
- [HESS85] J.P. Hardy, G.E. Ewing, R. Stables, and C.J.S.M. Simpson, *Thermodynamic measurements of adsorption of Xe and CO on NaCl(100)*, Surface Science Letters **159** (1985), L474 – L482.
- [HG91] M. Henzler and W. Göpel, *Oberflächenphysik des Festkörpers*, B. G. Teubner, Stuttgart, 1991.
- [Hor99] M. Horn-von Hoegen, *Growth of semiconductor layers studied by spot profile analysing low energy electron diffraction*, Zeitschrift für Kristallographie **214** (1999), Review Article.
- [HP79] P. Hollins and J. Pritchard, *Interactions of CO molecules adsorbed on Cu(111)*, Surface Science **89** (1979), 486 – 495.
- [HRH⁺99] W. Hebenstreit, J. Reidinger, Z. Horozova, M. Schmid, R. Podloucky, and P. Varga, *Atomic resolution by STM on ultra-thin films of alkali halides: experiment and local density calculation*, Surface Science **424** (1999), L321 – L328.
- [HS78] F.-J. Himpsel and W. Steinmann, *Angle-resolved photoemission from the NaCl (100) face*, Physical Review B **17** (1978), 2537 – 2544.
- [Huh88] J.E. Huheey, *Anorganische Chemie, Prinzipien von Struktur und Reaktivität*, de Gruyter, Berlin New York, 1988.
- [HWC85] M.A. Van Hove, W.H. Weinberg, and C.-M. Chan, *Low-Energy Electron Diffraction*, Springer-Verlag, Berlin Heidelberg New York, 1985.
- [JIH⁺98] J.F. Jia, K. Inoue, Y. Hasegawa, W.S. Yang, and T. Sakurai, *Variation of the local work function at steps on metal surfaces studied with STM*, Physical Review B **58** (1998), 1193 – 1196.
- [Kit83] Ch. Kittel, *Einführung in die Festkörperphysik*, R. Oldenburg Verlag, München Wien, 1983.

- [KMG95] U. Kürpick, G. Meister, and A. Goldmann, *Diffusion of Ag on Cu(110) and Cu(111) studied by spatially resolved UV-photoemission*, Applied Surface Science **89** (1995), 383 – 392.
- [LSEHT91] D.A. Lapiano-Smith, E.A. Eklund, F.J. Himpsel, and L.J. Terminello, *Epitaxy of LiF on Ge(100)*, Applied Physics Letters **59** (1991), 2174 – 2176.
- [MBR98] G. Meyer, L. Bartels, and K.-H. Rieder, *Atom manipulation with the scanning tunneling microscope: Nanostructuring and femtochemistry*, Japanese Journal of Applied Physics **37** (1998), 7143 – 7147.
- [MD95] S. Mahmud and E.R. Davidson, *Theoretical study of the adsorption of carbon monoxide on a NaCl(100) surface*, Surface Science **322** (1995), 342 – 360.
- [Mej96] J.A. Mejías, *Theoretical study of adsorption of Cu, Ag, and Au on the NaCl(100) surface*, Physical Review B **53** (1996), 10281 – 10288.
- [Mey96] G. Meyer, *A simple low-temperature ultrahigh-vacuum scanning tunneling microscope capable of atomic manipulation*, Review of Scientific Instruments **67** (1996), 2960 – 2965.
- [MHC92] W.E. McMahon, E.S. Hirschorn, and T.-C. Chiang, *Scanning tunneling microscopy study of an Ag monolayer on Cu(111)*, Surface Science Letters **279** (1992), L231 – L235.
- [MNP⁺99] T.E. Madey, C.-H. Nien, K. Pelhos, J.J. Kolodziej, I.M. Abdelrehim, and H.-S. Tao, *Faceting induced by ultrathin metal film: structure, electronic properties and reactivity*, Surface Science **438** (1999), 191 – 206.
- [Pea58] W.B. Pearson, *A handbook of lattice spacing and structure of metals and alloys*, Pergamon Press, New York, 1958.
- [PJLL75] R.T. Poole, J.G. Jenkin, J. Liesegang, and R.C.G. Leckey, *Electronic band structure of the alkali halides. I. Experimental parameters*, Physical Review B **11** (1975), 5179 – 5189.
- [Pri79] J. Pritchard, *On the structure of CO adlayers on Cu(100) and Cu(111)*, Surface Science **79** (1979), 231 – 244.
- [RBE87] H.H. Richardson, C. Baumann, and G.E. Ewing, *Infrared spectroscopy and thermodynamic measurements of CO on NaCl films*, Surface Science **185** (1987), 15 – 35.

- [REK59] G.M. Rothberg, M. Eisenstadt, and P. Kusch, *Free evaporation of alkali halide crystals*, The Journal of Chemical Physics **30** (1959), 517 – 527.
- [Rep99] J. Repp, *Rastertunnelmikroskopie und -spektroskopie an ultradünnen NaCl-Filmen auf hochindizierten Cu-Substratflächen und Nanostrukturierung auf atomarer Ebene von CO/Cu(211)*, Master's thesis, Freie Universität Berlin, 1999.
- [Rep02] J. Repp, *Rastertunnelmikroskopie und -spektroskopie an Adsorbaten auf Metall- und Isolatoroberflächen*, Ph.D. thesis, Freie Universität Berlin, 2002.
- [RFMR01] J. Repp, S. Fölsch, G. Meyer, and K.-H. Rieder, *Ionic films on vicinal metal surfaces: Enhanced binding due to charge modulation*, Physical Review Letters **86** (2001), 252 – 255.
- [SE91] J.A. Stroscio and D.M. Eigler, *Atomic and molecular manipulation with the scanning tunneling microscope*, Science **254** (1991), 1319 – 1326.
- [SMH86] U. Scheithauer, G. Meyer, and M. Henzler, *A new LEED instrument for quantitative spot profile analysis*, Surface Science **178** (1986), 441 – 451.
- [Smo41] R. Smoluchowski, *Anisotropy of the electronic work function of metals*, Physical Review **60** (1941), 661 – 674.
- [SNK92] K. Saiki, Y. Nakamura, and A. Koma, *Heteroepitaxial growth of alkali halide thin films on GaAs substrates*, Surface Science **269/270** (1992), 790 – 796.
- [SSP93] C. Schwennicke, J. Schimmelpfenning, and H. Pfnür, *Morphology of thin NaCl films grown epitaxially on Ge(100)*, Surface Science **293** (1993), 57 – 66.
- [Sto94] P. Stoltze, *Simulation of surface defects*, Journal of Physics: Condensed Matter **6** (1994), 9495 – 9517.
- [SW88] A.-C. Shi and M. Wortis, *Equilibrium shape of NaCl crystals: A first-principles calculation*, Physical Review B **37** (1988), 7793 – 7805.
- [TBL98] C. Teichert, J.C. Bean, and M.G. Lagally, *Self-organized nanostructures in Si_{1-x}Ge_x films on Si(001)*, Applied Physics A **67** (1998), 675 – 685.
- [TBOK99] C. Teichert, J. Barthel, H.P. Oepen, and J. Kirschner, *Fabrication of nanomagnet arrays by shadow deposition on self-organized semiconductor substrates*, Applied Physics Letters **74** (1999), 588 – 590.

- [TH59] J.W. Taylor and P.L. Hartman, *Photoelectric effects in certain of the alkali halides in the vacuum ultraviolet*, Physical Review **113** (1959), 1421 – 1435.
- [TH85] J. Tersoff and D.R. Hamann, *Theory of the scanning tunneling microscope*, Physical Review B **31** (1985), 805 – 813.
- [The02] W. Theis, *Fitprogram for SPA-LEED patterns*, 2002, personal communications.
- [WFH90] J. Wollschläger, J. Falta, and M. Henzler, *Electron diffraction at stepped homogeneous and inhomogeneous surfaces*, Applied Physics A **50** (1990), 57 – 68.
- [Win02] M. Winter, *Chemistry: WebElements – The Periodic Table on the WWW*, 2002, <http://www.webelements.com> and further references there.
- [WLH98] J. Wollschläger, E.Z. Luo, and M. Henzler, *Diffraction characterization of rough films formed under stable and unstable growth conditions*, Physical Review B **57** (1998), 15541 – 15552.
- [Wol92] D. Wolf, *Reconstruction of NaCl surfaces from a dipolar solution to the Madelung problem*, Physical Review Letters **68** (1992), 3315 – 3318.
- [WVB⁺01] J. Weckesser, A. De Vita, J.V. Barth, C. Cai, and K. Kern, *Mesoscopic correlation of supramolecular chirality in one-dimensional hydrogen-bonded assemblies*, Physical Review Letters **87** (2001), 096101–1 – 096101–4.
- [Wyc65] R.W.G. Wyckoff, *Crystal Structures*, Interscience, New York, 1965.
- [Zan88] A. Zangwill, *Physics at surfaces*, Cambridge University Press, 1988.
- [Zöp00] S. Zöphel, *Der Aufbau eines Tieftemperatur-Rastertunnelmikroskops und Strukturuntersuchungen auf vicinalen Kupferoberflächen*, Ph.D. thesis, Freie Universität Berlin, 2000.

List of Figures

1.1	Schematic picture of the tunneling geometry [TH85]	14
1.2	Arrangement of identical surface unit cells [Hen84]	16
1.3	Schematic set-up of the SPA-LEED system	17
1.4	Scattering geometry for the SPA-LEED instrument	17
1.5	Facet arrangement with the respective lattice rods	19
2.1	Heteroepitaxial growth modes close to thermal equilibrium [Bau58]	24
2.2	Heteroepitaxial growth modes considering the atomic arrangement of the first monolayer [Hen93]	25
2.3	Charge modulation of a corrugated metal surfaces	26
3.1	Hard-sphere models of the (211) and the (311) surface	30
3.2	Hard-sphere model of the (221) surface	31
3.3	Hard-sphere models of the (532) surface	32
3.4	Hard-sphere model of the (531) surface	33
3.5	Hard-sphere model for the rock salt structure of alkali-metal halides	34
4.1	LEED pattern of the clean Cu(311) surface	38
4.2	LEED pattern and line scan of 1 ML NaCl/Cu(311)	39
4.3	Hard-sphere model of NaCl on Cu(311)	40
4.4	LEED pattern, line scan, and gray scale plot of 3 ML NaCl/Cu(311)	43
4.5	Hard-sphere model of NaCl-induced Cu defect steps at the NaCl/Cu(311) interface	44
4.6	LEED pattern and line scan of the Cu(311) surface with 1 ML KCl	45
4.7	Hard-sphere model of the Cu(311) surface with KCl	46
4.8	LEED pattern and line scan for 3 ML KCl/Cu(311)	47
4.9	LEED patterns and STM image of the Cu(221) surface with and without NaCl deposition	49
4.10	Hard-sphere model of the NaCl configuration on Cu(221)	50
4.11	STM image of the Cu(221) surface with submonolayer coverage of NaCl	51

4.12	Atomically resolved STM images of monomolecular NaCl islands on the Cu(221) surface	52
4.13	LEED pattern and line scan of 6 ML NaCl/Cu(221)	53
5.1	LEED patterns of the clean Ag(211) surface and of the completely faceted Ag(211) surface after KCl deposition	56
5.2	Gray scale plot $I(k_{\perp}, k_{\parallel})$ of the faceted Ag(211) surface with 0.6 ML KCl	57
5.3	Hard-sphere model of the faceted (211) surface	58
5.4	LEED pattern and line scan of the Ag(311) facet after deposition of KCl on the Ag(211) surface	59
5.5	Hard-sphere model of the KCl-covered Ag(311) facet	60
5.6	LEED pattern of the Ag(111) facet after deposition of KCl on the Ag(211) surface	61
5.7	Gray scale plot with LEED pattern for the investigation of the spot splitting close to the in-phase energy for KCl on Ag(211)	62
6.1	STM image and diffraction pattern of the clean Cu(532) surface	66
6.2	Diffraction pattern of the faceted Cu(532) surface after the deposition of 0.6 ML NaCl	67
6.3	Analysis of the facet orientations using a set of diffraction patterns	68
6.4	Overview STM image of the facet structure	70
6.5	STM image and self-correlation function of the pyramidal facet structure	71
6.6	Atomically resolved STM image of the three facets	72
6.7	Hard-sphere model of the pyramidal structure	73
6.8	STM images of the (111) facet	74
6.9	Diffraction patterns of the (111) facet	75
6.10	Diffraction pattern and line scan of the NaCl-covered (311) facet	77
6.11	Hard-sphere model of the NaCl configuration on the (311) facet	78
6.12	STM images of the NaCl-covered (311) facet	79
6.13	Diffraction pattern of the NaCl-covered (531) facet	81
6.14	Hard-sphere model of the NaCl configuration on the stepped (531) facet	82
6.15	STM image with line scan of the NaCl-covered (531) facet	84
6.16	STM images of the faceted Cu(532) surface after adsorbing CO	86
6.17	STM images of the faceted Cu(532) surface after deposition of Ag	88
6.18	STM image and line scan of the (111) facet after the deposition of Ag	89
6.19	Hard-sphere model of an Ag adlayer on Cu(111)	90
6.20	STM image and line scan of the (311) facet after Ag deposition	92

6.21	STM image and hard-sphere models of the stepped (311) facet after Ag deposition	93
6.22	STM image and line scan of the (531) facet after Ag deposition	94
A.1	Calculated diffraction pattern for a fcc(211) and a fcc(311) surface	100
A.2	Calculated diffraction pattern for a fcc(221) and a fcc(111) surface	102
A.3	Calculated diffraction pattern for a fcc(532) surface	103
A.4	Calculated diffraction pattern for a fcc(531) surface	104

