The origins of friction and the growth of graphene, investigated at the atomic scale

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Bibliography

[1] M. Dienwiebel, G. S. Verhoeven, N. Pradeep and J. W. M. Frenken. "Superlubricity of Graphite". *Physical Review Letters* **92**: (2004). DOI: 10.1103/PhysRevLett.92.126101.

[2] D. Downson. *History of tribology*. London: Longman, 2nd edition, 1998. ISBN: 978-1-86058-070-3.

[3] F. Bowden and D. Tabor. "The area of contact between stationary and between moving surfaces". *Proceedings of the Royal Society of London. Series A* **169**: (1939), pp. 391–413. DOI: http://dx.doi.org/10.1098/rspa.1939.0005.

[4] C. M. Mate, G. M. McClelland, R. Erlandsson and S. Chiang. "Atomic-Scale Friction of a Tungsten Tip on a Graphite Surface". *Physical Review Letters* **59**: (1987), pp. 1942–1946. DOI: 10.1103/PhysRevLett.59.1942.

[5] M. Dienwiebel, E. de Kuyper, L. Crama, J. W. M. Frenken, J. Heimberg, D.-J. Spaanderman, D. Glastra van Loon, T. Zijlstra and E. van der Drift. "Design and performance of a high-resolution frictional force microscope with quantitative three-dimensional force sensitivity". *Review of Scientific Instruments* **76**: (2005). ISSN: 00346748. DOI: 10.1063/1.1889233.

[6] A. Schirmeisen, L. Jansen and H. Fuchs. "Tip-jump statistics of stick-slip friction". *Physical Review B* **71**: (2005). ISSN: 1098-0121. DOI: 10.1103/PhysRevB.71.245403.

[7] J. Sokoloff. "Theory of energy dissipation in sliding crystal surfaces". *Physical Review B* **42**: (1990), pp. 760–765. DOI: 10.1103/PhysRevB.42.760. arXiv: mat.

[8] J. Pendry. "Shearing the Vacuum - Quantum Friction". *Journal of Physics. Condensed Matter* **9**: (1997), pp. 10301–10320. ISSN: 0953-8984. DOI: 10.1088/0953-8984/9/47/001. arXiv: 9707190 [cond-mat].

[9] L. Prandtl. “Ein Gedankenmodell zur kinetischen Theorie der festen Körper”. *Z. Angew. Math. Mech.* **8**: (1928), pp. 85–106.

[10] G. Tomlinson. “A molecular theory of friction”. *Philos. Mag.* **7**: (1929), pp. 905–939. DOI: 10.1080/14786440608564819.

[11] Y. Sang, M. Dubé and M. Grant. “Thermal Effects on Atomic Friction”. *Physical Review Letters* **87**: (2001), pp. 1–4. ISSN: 0031-9007. DOI: 10.1103/PhysRevLett.87.174301.

[12] P. Steiner, R. Roth, E. Gnecco, A. Baratoff, S. Maier, T. Glatzel and E. Meyer. “Two-dimensional simulation of superlubricity on NaCl and highly oriented pyrolytic graphite”. *Physical Review B* **79**: (2009), pp. 1–9. ISSN: 1098-0121. DOI: 10.1103/PhysRevB.79.045414.

[13] C. Garrod. *Statistical Mechanics and Thermodynamics*. New York: Oxford University Press, 1995. ISBN: 9780195085235. DOI: 10.1007/BF02189242.

[14] A. Socoliuc, R. Bennewitz, E. Gnecco and E. Meyer. “Transition from Stick-Slip to Continuous Sliding in Atomic Friction: Entering a New Regime of Ultralow Friction”. *Physical Review Letters* **92**: (2004). DOI: 10.1103/PhysRevLett.92.134301.

[15] S. Maier, Y. Sang, T. Filleter, M. Grant, R. Bennewitz, E. Gnecco and E. Meyer. “Fluctuations and jump dynamics in atomic friction experiments”. *Physical Review B* **72**: (2005), pp. 1–9. ISSN: 1098-0121. DOI: 10.1103/PhysRevB.72.245418.

[16] D. Abel, S. Y. Krylov and J. W. M. Frenken. “Evidence for Contact Delocalization in Atomic Scale Friction”. *Physical Review Letters* **99**: (2007). ISSN: 0031-9007. DOI: 10.1103/PhysRevLett.99.166102.

[17] S. Y. Krylov and J. W. M. Frenken. “Thermal contact delocalization in atomic scale friction: a multitude of friction regimes”. *New Journal of Physics* **9**: (2007), pp. 1–26. DOI: 10.1088/1367-2630/9/10/398.

[18] M. Hirano, S. Kazumasa, R. Kaneko and Y. Murata. “Observation of Superlubricity by Scanning Tunneling Microscopy”. *Physical Review Letters* **78**: (1997), pp. 1448–1451. DOI: 10.1103/PhysRevLett.78.1448. arXiv: ssoko.

[19] M. Hirano, K. Shinjo, R. Kaneko and Y. Murata. “Anisotropy of Frictional Forces in Muscovite Mica”. *Physical Review Letters* **67**: (1991), pp. 2642–2646. DOI: 10.1103/PhysRevLett.67.2642.

[20] S. Y. Krylov, K. Jinesh, H. Valk, M. Dienwiebel and J. W. M. Frenken. "Thermally induced suppression of friction at the atomic scale". *Physical Review E* **71**: (2005), pp. 1–4. ISSN: 1539-3755. DOI: 10.1103/PhysRevE.71.065101.

[21] C. Wieferink, P. Krüger and J. Pollmann. "Simulations of friction force microscopy on the KBr(001) surface based on ab initio calculated tip-sample forces". *Physical Review B* **83**: (2011). ISSN: 1098-0121. DOI: 10.1103/PhysRevB.83.235328.

[22] B. Persson. "Surface resistivity: theory and applications". *Surface Science* **269-270**: (1992), pp. 103–112. ISSN: 00396028. DOI: 10.1016/0039-6028(92)91234-3.

[23] D. C. Senft and G. Ehrlich. "Long Jumps in Surface Diffustion: One-Dimenstional Migration of Isolated Adatoms". *Physical Review Letters* **74**: (1995), pp. 294–297. DOI: 10.1103/PhysRevLett.74.294.

[24] T. Ala-Nissila and S. Ying. "Universality in diffusion of classical adatoms on surfaces". *Modern Physics Letters B* **4**: (1990), pp. 1369–1372. DOI: 10.1142/S0217984990001719.

[25] N. Lorente and H. Ueba. "CO dynamics induced by tunneling electrons: differences on Cu(110) and Ag(110)". *The European Physical Journal D* **35**: (2005), pp. 341–348. ISSN: 1434-6060. DOI: 10.1140/epjd/e2005-00214-6.

[26] F. Giessibl and G. Binnig. "Investigation of the (001) cleavage plane of potassium bromide with an atomic force microscope at 4.2 K in ultrahigh vacuum". *Ultramicroscopy* **42-44**: (1992), pp. 281–289. DOI: 10.1016/0304-3991(92)90280-W.

[27] T. Schimmel, T. Koch, J. Küppers and M. Lux-Steiner. "True atomic resolution under ambient conditions obtained by atomic force microscopy in the contact mode". *Applied Physics A* **68**: (1999), pp. 399–402. DOI: 10.1007/s003399900943.

[28] P. Steiner, E. Gnecco, T. Filleter, N. N. Gosvami, S. Maier, E. Meyer and R. Bennewitz. "Atomic Friction Investigations on Ordered Superstructures". *Tribology Letters* **39**: (2010), pp. 321–327. ISSN: 1023-8883. DOI: 10.1007/s11249-010-9677-2.

[29] R. Bennewitz. "Friction force microscopy". *Materials Today* **8**: (2005), pp. 42–48. ISSN: 1369-7021. DOI: 10.1016/S1369-7021(05)00845-X.

[30] G. S. Verhoeven, M. Dienwiebel and J. W. M. Frenken. "Model calculations of superlubricity of graphite". *Physical Review B* **70**: (2004). DOI: 10.1103/PhysRevB.70.165418.

[31] J. W. J. Kerssemakers. *Concept of interactions in local probe microscopy*. PhD thesis, University of Groningen, 1997. ISBN: 903670815X.

[32] G. Box and M. Muller. "Note on the Generation of Random Normal Deviates". *The Annals of Mathematical Statistics* **29**: (1958), pp. 610–611.

[33] K. S. Novoselov, A. K. Geim, S. Mozorov, D. Jiang, Y. Zhang, S. Dubonos, I. Grigorieva and A. Firsov. "Electric Field Effect in Atomically Thin Carbon Films". *Science* **306**: (2004), pp. 666–669.

[34] S. Chen, L. Brown, M. Levendorf, W. Cai, S.-Y. Ju, J. Edgeworth, X. Li, C. W. Magnuson, A. Velamakanni, R. D. Piner, J. Kang, J. Park and R. S. Ruoff. "Oxidation Resistance of Graphene-Coated Cu and Cu/Ni Alloy". *ACS nano* **5**: (2011), pp. 1321–1327. DOI: 10.1021/nn103028d.

[35] K. S. Novoselov, V. I. Falko, L. Colombo, P. R. Gellert, M. G. Schwab and K. Kim. "A roadmap for graphene". *Nature* **490**: (2012), pp. 192–200. ISSN: 0028-0836. DOI: 10.1038/nature11458.

[36] Y. Wu, Y.-m. Lin, A. A. Bol, K. A. Jenkins, F. Xia, D. B. Farmer, Y. Zhu and P. Avouris. "High-frequency, scaled graphene transistors on diamond-like carbon." *Nature* **472**: (2011), pp. 74–78. ISSN: 1476-4687. DOI: 10.1038/nature09979.

[37] S.-J. Han, A. V. Garcia, S. Oida, K. A. Jenkins and W. Haensch. "Graphene radio frequency receiver integrated circuit." *Nature communications* **5**: (2014). ISSN: 2041-1723. DOI: 10.1038/ncomms4086.

[38] K. S. Novoselov, D Jiang, F Schedin, T. J. Booth, V. V. Khotkevich, S. V. Morozov and A. K. Geim. "Two-dimensional atomic crystals". *PNAS* **102**: (2005), pp. 10451–10453. DOI: 10.1073/pnas.0502848102.

[39] L. Tao, J. Lee, M. Holt, H. Chou, S. J. McDonnell, D. A. Ferrer, M. G. Babenco, R. M. Wallace, S. K. Banerjee, R. S. Ruoff and D. Akinwande. "Uniform Wafer-Scale Chemical Vapor Deposition of Graphene on Evaporated Cu (111) Film with Quality Comparable to Exfoliated Monolayer". *The Journal of Physical Chemistry C* **116**: (2012), pp. 24068–24074. ISSN: 1932-7447. DOI: 10.1021/jp3068848.

[40] N. Petrone, C. R. Dean, I. Meric, A. M. van der Zande, P. Y. Huang, L. Wang, D. Muller, K. L. Shepard and J. Hone. "Chemical Vapor Deposition-Derived Graphene with Electrical Performance of Exfoliated Graphene". *Nano letters* **12**: (2012), pp. 2751–2756. ISSN: 1530-6992. DOI: 10.1021/nl204481s.

[41] Q. Yu, Z. Liu, D. Pandey, D. Wei, T. F. Chung and P. Peng. "Control and characterization of individual grains and grains boundaries in graphene grown by chemical vapour deposition". *Nature Materials* (2011), pp. 1–7. DOI: 10.1038/NMAT3010.

[42] W. Regan, S. Aloni, . V. Altoe, . N. Alem, B. Geng, L. Maserati, M. Crommie, F. Wang and A Zettl. "Transfer-Free Batch Fabrication of Large- Area Suspended Graphene Membranes". *ACS nano* **4**: (2010), pp. 4762–4768. DOI: 10.1021/nn100459u.

[43] V. E. Calado, G. F. Schneider, A. M. M. G. Theulings, C Dekker, L. M. K. Vandersypen, V. E. Calado, G. F. Schneider, A. M. M. G. Theulings, C Dekker and L. M. K. Vandersypen. "Formation and control of wrinkles in graphene by the wedging transfer method". *Applied Physics Letters* **101**: (2012). DOI: 10.1063/1.4751982.

[44] R. E. Honig. *Vapor pressure data for solid and liquid elements*. Vol. 23. RCA Review. RCA Laboratories, 1962.

[45] L. Kuipers, M. Hoogeman and J. W. M. Frenken. "Jump to contact and neck formation between Pb surfaces and a STM tip". *Surface Science* **340**: (1995), pp. 231–244. DOI: 10.1016/0039-6028(95)00702-4. arXiv: reg.

[46] G. C. Dong, D. W. van Baarle, M. J. Rost and J. W. M. Frenken. "Graphene formation on metal surfaces investigated by in-situ scanning tunneling microscopy". *New Journal of Physics* **14**: (2012). ISSN: 1367-2630. DOI: 10.1088/1367-2630/14/5/053033.

[47] J. Coraux, A. T. N'Diaye, M. Engler, C. Busse, D. Wall, N. Buckanie, F.-J. Meyer zu Heringdorf, R. van Gastel, B. Poelsema and T. Michely. "Growth of graphene on Ir(111)". *New Journal of Physics* **11**: (2009). ISSN: 1367-2630. DOI: 10.1088/1367-2630/11/2/023006.

[48] E. Loginova, S. Nie, K. Thürmer, N. Bartelt and K. McCarty. "Defects of graphene on Ir(111): Rotational domains and ridges". *Physical Review B* **80**: (2009). ISSN: 1098-0121. DOI: 10.1103/PhysRevB.80.085430.

[49] S. Lizzit and A. Baraldi. "High-resolution fast X-ray photoelectron spectroscopy study of ethylene interaction with Ir(111): From chemisorption to dissociation and graphene formation". *Catalysis Today* **154**: (2010), pp. 68–74. ISSN: 09205861. DOI: 10.1016/j.cattod.2010.05.028.

[50] M. Hoogeman, D. Glastra Van Loon, R. Loos, H. Ficke, E. de Haas, J. van der Linden, H. Zeijlemaker, L. Kuipers, M. Chang, M. Klik and J. W. M. Frenken. "Design and performance of a programmable-temperature scanning tunneling microscope". *Review of Scientific Instruments* **69**: (1998), pp. 2072–2080. DOI: 10.1063/1.1148901.

[51] M. J. Rost. *Energetics of the Au(110)-surface, one reason for many structures*. PhD thesis, Leiden University, 2001. ISBN: 9077017224.

[52] *Newport*. https://www.newport.com. Visited: 2016-03-28.

[53] *Pfeiffer Vacuum*. https://www.pfeiffer-vacuum.com/en/. Visited: 2016-03-28.

[54] *Eurotherm by Schneider Electric*. http://www.eurotherm.com. Visited: 2016-03-28.

[55] *Riber*. http://www.riber.com. Visited: 2016-03-28.

[56] *Agilent Technologies*. http://www.agilent.com/home. Visited: 2016-03-28.

[57] *Specs Surface Nano Analysis*. http://www.specs.de/. Visited: 2016-03-28.

[58] *Sigma Aldrich*. http://www.sigmaaldrich.com/. Visited: 2016-04-02.

[59] *Messer*. http://www.specialtygases.de. Visited: 2016-04-02.

[60] M. Rost, L. Crama, P. Schakel, E. van Tol, C. Overgauw, H. Horst, H. Dekker, B. Okhuijsen, M. Seynen, A. Vijftigschild, P. Han, A. Katan, K. Schoots, R. Schumm, W. van Loo, T. Oosterkamp and J. W. M. Frenken. "Scanning probe microscopes go video rate and beyond". *Review of Scientific Instruments* **76**: (2005). DOI: 10.1063/1.1915288.

[61] W. J. Arnoult and R. B. Mclellan. "The Solubility of Carbon in Rhodium, Ruthenium, Iridium and Rhenium". *Scripta Metallurgica* **6**: (1972), pp. 1013–1018.

[62] K. F. McCarty, P. J. Feibelman, E. Loginova and N. C. Bartelt. "Kinetics and thermodynamics of carbon segregation and graphene growth on Ru (0001)". *Carbon* **47**: (2009), pp. 1806–1813. ISSN: 0008-6223. DOI: 10.1016/j.carbon.2009.03.004.

[63] *Surface Preparation Laboratory*. http://www.spl.eu. Visited: 2015-09-22.

[64] M. Asadian, F. Hajiesmaeilbaigi, N. Mirzaei, H. Saeedi, Y. Khodaei and S. Enayati. "Composition and dissociation processes analysis in crystal growth of Nd:GGG by the Czochralski method". *Journal of Crystal Growth* **312**: (2010), pp. 1645–1650. ISSN: 00220248. DOI: 10.1016/j.jcrysgro.2010.01.044.

[65] K. Jacobs, D. Schulz, D. Klimm and S. Ganschow. "Melt growth of ZnO bulk crystals in Ir crucibles". *Solid State Sciences* **12**: (2010), pp. 307–310. ISSN: 12932558. DOI: 10.1016/j.solidstatesciences.2009.05.015.

[66] M. Asadian. "The Influence of Atmosphere on Oxides Crystal Growth". *Modern aspects of bulk crystal and thin film preparation*. Ed. by N. Kolesnikov and E. Barisenko. Rijeka: InTech, 2012. Chap. 6, pp. 123–140. ISBN: 978-953-307-610-2. DOI: 10.5772/1348.

[67] M. Gsell, P. Jakob and D. Menzel. "Effect of Substrate Strain on Adsorption". *Science* **280**: (1998), pp. 717–720. DOI: 10.1126/science.280.5364.717.

[68] A. Janssen and J. Jones. "The sharpening of field emitter tips by ion sputtering". *Journal of Physics D: Applied Physics* **4**: (1971), pp. 118–123. ISSN: 00223727. DOI: 10.1088/0022-3727/4/1/316.

[69] A. T. N'Diaye, J. Coraux, T. N. Plasa, C. Busse and T. Michely. "Structure of epitaxial graphene on Ir(111)". *New Journal of Physics* **10**: (2008). ISSN: 1367-2630. DOI: 10.1088/1367-2630/10/4/043033.

[70] C. Busse, P. Lazić, R. Djemour, J. Coraux, T. Gerber, N. Atodiresei, V. Caciuc, R. Brako, A. T. N'Diaye, S. Blügel, J. Zegenhagen and T. Michely. "Graphene on Ir(111): Physisorption with Chemical Modulation". *Physical Review Letters* **107**: (2011). ISSN: 0031-9007. DOI: 10.1103/PhysRevLett.107.036101.

[71] G. Dong. *Formation of graphene and hexagonal boron nitride on Rh(111) studied by in-situ scanning tunneling microscopy*. PhD thesis, Casimir PhD series, 2012. ISBN: 9789085931386.

[72] B. Nieuwenhuys, D. Hagen, G. Rovida and G. Somorjai. "LEED, AES and Thermal desorption studies of chemisorbed hydrogen and hydrocarbons on the (111) and steppend [6(111)x(100)] iridium crystal surfaces; comparison with platinum". *Surface Science* **59**: (1976), pp. 155–176. DOI: 10.1016/0039-6028(76)90298-3.

[73] P. Lacovig, M. Pozzo, D. Alfè, P. Vilmercati, A. Baraldi and S. Lizzit. "Growth of dome-shaped carbon nanoislands on Ir(111): The intermediate between carbidic clusters and quasi-free-standing graphene". *Physical Review Letters* **103**: (2009), pp. 14–17. ISSN: 00319007. DOI: 10.1103/PhysRevLett.103.166101.

[74] M. Zinke-Allmang, L. C. Feldman and M. H. Grabow. "Clustering on surfaces". *Surface Science Reports* **16**: (1992), pp. 377–463. ISSN: 01675729. DOI: 10.1016/0167-5729(92)90006-W.

[75] H. Hattab, A. N'Diaye, D. Wall, G. Jnawali, J. Coraux, C. Busse, R. van Gastel, B. Poelsema, T. Michely, F.-J. Meyer zu Heringdorf and M. Horn-von Hoegen. "Growth temperature dependent graphene alignment on Ir(111)". *Applied Physics Letters* **98**: (2011). ISSN: 00036951. DOI: 10.1063/1.3548546.

[76] R. van Gastel, A. T. N'Diaye, D. Wall, J. Coraux, C. Busse, N. M. Buckanie, F.-J. Meyer zu Heringdorf, M. Horn von Hoegen, T. Michely and B. Poelsema. "Selecting a single orientation for millimeter sized graphene sheets". *Applied Physics Letters* **95**: (2009). ISSN: 00036951. DOI: 10.1063/1.3225554.

[77] G. Dong and J. W. M. Frenken. "Kinetics of graphene formation on Rh(111) investigated by in situ scanning tunneling microscopy." *ACS nano* **7**: (2013), pp. 7028–7033. ISSN: 1936-086X. DOI: 10.1021/nn402229t.

[78] W. Ostwald. *Zeitschrift für Physikalische Chemie* **34**: (1900), pp. 495–503.

[79] G. Rosenfeld, K. Morgenstern, I. Beckmann, W. Wulfhekel, E. Lægsgaard, F. Besenbacher and G. Comsa. "Stability of two-dimensional clusters on crystal surfaces: from Ostwald ripening to single-cluster decay". *Surface Science* **402-404**: (1998), pp. 401–408. DOI: 10.1016/S0039-6028(98)00024-7.

[80] M. Zinke-Allmang. "Phase separation on solid surfaces: nucleation, coarsening and coalescence kinetics". *Thin Solid Films* **346**: (1999), pp. 1–68. ISSN: 00406090. DOI: 10.1016/S0040-6090(98)01479-5.

[81] A. W. Tsen, L. Brown, M. P. Levendorf, F. Ghahari, P. Y. Huang, R. W. Havener, C. S. Ruiz-Vargas, D. A. Muller, P. Kim and J. Park. "Tailoring Electrical Transport Across Grain Boundaries in Polycrystalline Graphene". *Science* **336**: (2012), pp. 1143–1146. ISSN: 1095-9203. DOI: 10.1126/science.1218948.

[82] Z. Fei, A. S. Rodin, W. Gannett, S. Dai, W. Regan, M. Wagner, M. K. Liu, A. S. Mcleod, G. Dominguez, M. Thiemens, A. H. C. Neto, F. Keilmann, A. Zettl, R. Hillenbrand, M. M. Fogler and D. N. Basov. "Electronic and plasmonic phenomena at graphene grain boundaries". *Nature Nanotechnology* **8**: (2013), pp. 821–825. DOI: 10.1038/NNANO.2013.197.

[83] J. Coraux, A. T. N'Diaye, C. Busse and T. Michely. "Structural coherency of graphene on Ir(111)." *Nano letters* **8**: (2008), pp. 565–570. ISSN: 1530-6984. DOI: 10.1021/nl0728874.

[84] G. Cao. "Atomistic Studies of Mechanical Properties of Graphene". *Polymers* **6**: (2014), pp. 2404–2432. DOI: 10.3390/polym6092404.

[85] F. Banhart, J. Kotakoski and A. V. Krasheninnikov. "Structural Defects in Graphene". *ACS nano* **5**: (2011), pp. 26–41. DOI: 10.1021/nn102598m.

[86] P. W. Sutter, J.-I. Flege and E. a. Sutter. "Epitaxial graphene on ruthenium." *Nature materials* **7**: (2008), pp. 406–411. ISSN: 1476-1122. DOI: 10.1038/nmat2166.

[87] X. Li. "Large-Area Synthesis of High-Quality and Uniform Graphene Films on Copper Foils". *Science* **324**: (2009). DOI: 10.1126/science.1171245.

[88] H. I. Rasool, E. B. Song, M. Mecklenburg, B. C. Regan, K. L. Wang, B. H. Weiller and J. K. Gimzewski. "Atomic-scale characterization of graphene grown on copper (100) single crystals." *Journal of the American Chemical Society* **133**: (2011), pp. 12536–43. ISSN: 1520-5126. DOI: 10.1021/ja200245p.

[89] S. Nie, A. L. Walter, N. C. Bartelt, E. Starodub, A. Bostwick, E. Rotenberg and K. F. McCarty. "Growth from below: graphene bilayers on Ir(111)." *ACS nano* **5**: (2011), pp. 2298–2306. ISSN: 1936-086X. DOI: 10.1021/nn103582g.

[90] L. Kuipers, M. Hoogeman and J. W. M. Frenken. "Step dynamics on Au(110) studied with a high-temperature, high-speed scanning tunneling microscope". *Physical Review Letters* **71**: (1993), pp. 3517–3520. DOI: 10.1103/PhysRevLett.71.3517.

[91] L. Kuipers, M. Hoogeman, J. W. M. Frenken and H. van Beijeren. "Step and kink dynamics on Au(110) and Pb(111) studied with a high-speed STM". *Physical Review B* **52**: (1995), pp. 11387–11397. DOI: 10.1103/PhysRevB.52.11387.

[92] M. Giesen and G. S. Icking-Konert. "Equilibrium fluctuations and decay of step bumps on vicinal Cu(111) surfaces". *Surface Science* **412/413**: (1998), pp. 645–656. DOI: 10.1016/S0039-6028(98)00499-3.

[93] M. Giesen, G. S. Icking-Konert, D. Stapel and H. Ibach. "Step fluctuations on Pt(111) surfaces". *Surface Science* **366**: (1996), pp. 229–238. DOI: 10.1016/0039-6028(96)00823-0.

[94] M. Giesen-Seibert and H. Ibach. "On the time structure of tunneling images of steps". *Surface Science* **316**: (1994), pp. 205–222. DOI: 10.1016/0039-6028(94)91141-X.

[95] M. S. Hoogeman, L. Kuipers, D. C. Schlösser and J. W. M. Frenken. "Direct observation and analysis of kink dynamics". *Surface Review and Letters* **447**: (2000), pp. 25–38. DOI: 10.1016/S0039-6028(99)01175-9.

[96] G. S. Verhoeven and J. W. M. Frenken. "The return of the kink". *Surface Science* **601**: (2007), pp. 13–23. ISSN: 00396028. DOI: 10.1016/j.susc.2006.09.001.

[97] N. Bartelt, J. Goldberg, T. Einstein and E. D. Williams. "The equilibration of terrace width distributions on stepped surfaces". *Surface Science* **273**: (1992), pp. 252–260. ISSN: 00396028. DOI: 10.1016/0039-6028(92)90290-M.