

Curriculum Vitae

Matthias Marcus Batzill

Date of birth: Oct.20.1969
Nationality: Germany

Address: 2920 Ramada Dr. Apt. 129
Tampa, FL 33613
e-mail: mbatzill@cas.usf.edu

Education

- May '96- May '99* **PhD studies:** Surface Physics Group (affiliated with the Centre of Nanoscale Science & Technology) at the Department of Physics, University of Newcastle upon Tyne, UK.
PhD advisor: Prof. Ken J. Snowdon.
Thesis title: “*Fabrication and Characterization of Nanostructures on CaF₂*”.
PhD in Physics, May '99.
- Oct '93- May '96* **MSc studies:** Department of Physics, Georg-August-Universität Göttingen, Germany. Diploma thesis: „*Aufbau und Erprobung eines UHV-Rastertunnelmikroskops*“
Diploma (equivalent to MSc) in Physics, May '96.
- Oct '92-Jul '93* visiting student at the University of East Anglia, Norwich, UK;
study of environmental sciences.
- Oct '90-Sep '92* **BSc studies:** study of geophysics at the University of Karlsruhe, Germany;
pre-diploma (equivalent to BSc) in geophysics.

Professional Experience

- Since Aug '06* Assistant Professor, Department of Physics, University of South Florida, Tampa, FL.
- Nov '01-Jul '03 and since Jul '04* **Post-doctoral research associate** in the Surface Physics Group of Prof. Ulrike Diebold, Department of Physics, Tulane University, New Orleans, USA.
- Sept '05-Jan '06* **Visiting Scholar**, Rutgers University- The State University of New Jersey, Piscataway, NJ, USA.
- Jul '03-June '04* **Visiting Assistant Professor**, Department of Physics, Tulane University, New Orleans, USA.
- May '03* **Guest scientist** in Flemming Besenbacher's group in the Department of Physics, University of Aarhus, Denmark.
- June '99-Oct '01* **Post-doctoral research associate** in the Surface Science Group of Prof. Bruce E. Koel, Department of Chemistry, Univ. of Southern California, Los Angeles, USA.
- Nov '00* **Guest researcher** Osaka National Research Institute, Osaka, Japan.

List of Publications

1. “Preparation by glancing incidence ion irradiation of CaF_2 surfaces with Ångström-scale RMS roughness”, M. Wissing, M. Batzill, K.J. Snowdon, *Nanotechnology* **8**, 40-45 (1997).
2. “Fabrication of periodic nanoscale Ag-wire arrays on vicinal CaF_2 surfaces”, M. Batzill, M. Sarstedt, K.J. Snowdon, *Nanotechnology* **9**, 20-29 (1998).
3. “Preferential sputtering induced stress domains and mesoscopic phase separation on $\text{CaF}_2(111)$ ”, M. Batzill, F. Bardou, K.J. Snowdon, *Phys. Rev. Lett.* **85**, 780-783 (2000).
4. “Shape transition of calcium islands formed by electron stimulated desorption of fluorine from a $\text{CaF}_2(111)$ surface”, M. Batzill, K.J. Snowdon, *Appl. Phys. Lett.* **77**, 1955-1957 (2000).
5. “Electronic contrast in scanning tunneling microscopy of $\text{Sn/Pt}(111)$ surface alloys”, M. Batzill, D.E. Beck, B.E. Koel, *Surf. Sci.* **466**, L821-L826 (2000).
6. “Self-organized molecular-sized, hexagonally ordered SnO_x nanodot superlattices on $\text{Pt}(111)$ ”, M. Batzill, D.E. Beck, B.E. Koel, *Appl. Phys. Lett.* **78**, 2766-2768 (2001).
7. “Self-organization of large-area periodic nanowire arrays by glancing incidence ion bombardment of $\text{CaF}_2(111)$ surfaces”, M. Batzill, F. Bardou, K.J. Snowdon, *J. Vac. Sci. Technol. A* **19**, 1829-1834 (2001).
8. “Tin-oxide overlayer formation by oxidation of $\text{Pt-Sn}(111)$ surface alloys”, M. Batzill, D.E. Beck, D. Jerdev, B.E. Koel, *J. Vac. Sci. Technol. A* **19**, 1953-1958 (2001).
9. “Ion beam directed self-organization of conducting nanowire arrays”, M. Batzill, F. Bardou, K.J. Snowdon, *Phys. Rev. B* **63**, 233408 (2001).
10. “Structure of monolayer tin-oxide films on $\text{Pt}(111)$ formed using NO_2 as an efficient oxidant”, M. Batzill, D.E. Beck, B.E. Koel, *Phys. Rev. B* **64**, 245402 (2001).
11. “Ultrahigh vacuum instrument that combines variable-temperature scanning tunneling microscopy with Fourier transform infrared reflection-absorption spectroscopy for studies of chemical reactions at surfaces”, D.E. Beck, M. Batzill, C. Baur, B.E. Koel, *Rev. Sci. Instr.* **73**, 1267-1272 (2002).
12. “Deposition of silver on the $\text{Pt}(100)$ -hex surface: Kinetic control of alloy formation and composition by surface reconstruction”, M. Batzill, B.E. Koel, *Surf. Sci. Lett.* **498**, L85-L90 (2002).

13. “Evidence for slow oxygen exchange between multiple adsorption sites at high oxygen coverages on Pt(111)”, D. I. Jerdev, J. Kim, M. Batzill, B.E. Koel, *Surf. Sci. Lett.* **498**, L91-L96 (2002).
14. “Variations of the local electronic surface properties of TiO₂(110) induced by intrinsic and extrinsic defects”, M. Batzill, B. Katsiev, D. J. Gaspar, U. Diebold, *Phys. Rev. B.* **66**, 235401 (2002).
15. “The influence of subsurface, charged impurities on the adsorption of chlorine at TiO₂(110)”, M. Batzill, E. L. D. Hebenstreit, W. Hebenstreit, U. Diebold, *Chem. Phys. Lett.* **367**, 319-323 (2003).
16. “Surface morphologies of SnO₂(110)”, M. Batzill, B. Katsiev, U. Diebold, *Surf. Sci.* **529**, 295-311 (2003).
17. “Ag on Pt(100): Alloying versus surface reconstruction- two competing mechanisms to reduce surface stress”, M. Batzill, B. E. Koel, *Europhys. Lett.* **64**, 70 (2003).
18. “Structural and chemical properties of a c(2×2)-Ti/Pt(100) second-layer alloy – a probe of strong ligand effects on surface Pt atoms”, S. Hsieh, T. Matsumoto, M. Batzill, B. E. Koel, *Phys. Rev. B* **68**, 205417 (2003).
19. “Oxygen chemistry of a gas sensing material: SnO₂ (101)” M. Batzill, A. M. Chaka, U. Diebold, *Europhys. Lett.* **65**, 61 (2004).
20. “Silver on Pt(100)- room temperature growth and high temperature alloying”, M. Batzill, B. E. Koel, *Surf. Sci.* **553**, 50 (2004).
21. “Suppressed surface alloying for a bulk miscible system: Ge on Pt(100)”, M. Batzill, T. Matsumoto, C-S. Ho, B.E. Koel, *Phys. Rev. B.* **69**, 113401 (2004).
22. “Epitaxial growth of tin-oxide on Pt(111): Structure and properties of wetting layers and SnO₂ crystallites”, M. Batzill, J. Kim, D.E. Beck, B.E. Koel, *Phys. Rev. B* **69**, 165403 (2004).
23. “Metastable surface structures of the bimetallic Sn/Pt(100) system”, M. Batzill, D. Beck, B.E. Koel, *Surf. Sci.* **558**, 35 (2004).
24. “The surface structure of TiO₂(011)-2x1” T. J. Beck, A. Klust, M. Batzill, C. DiValentin, A. Selloni, U. Diebold, *Phys. Rev. Lett.* **93**, 036104 (2004).
25. “Tuning the oxide/organic interface: Benzene on SnO₂(101)” M. Batzill, K. Katsiev, U. Diebold, *Appl. Phys. Lett.* **85**, 5766 (2004).
26. “Fundamental studies of titanium oxide-Pt(100) interfaces. I. Stable high temperature structures formed by annealing TiO_x films on Pt(100)”, T. Matsumoto, M. Batzill, S. Hsieh, and B.E. Koel, *Surf. Sci.* **572**, 127 (2004).

27. “Fundamental studies of titanium oxide-Pt(100) interfaces. II. Influence of oxidation and reduction reactions on the surface structure of TiOx films on Pt(100)”, T. Matsumoto, M. Batzill, S. Hsieh, and B. E. Koel, *Surf. Sci.* **572**, 146 (2004).
28. “Adsorption of water on the TiO₂(011)-2x1 reconstructed surface” C. Di Valentin, A. Tilocca, A. Selloni, T.J. Beck, A. Klust, M. Batzill, Y. Losovyj, U. Diebold, *J. Am. Chem. Soc.* **127**, 9895 (2005).
29. “Pure and Co-doped SnO₂(101)films grown by MBE on Al₂O₃(012)” M. Batzill, J.M. Burst, U. Diebold, *Thin Solid Films* **484**, 132 (2005).
30. “Mixed dissociated/molecular monolayer of water on the TiO₂(011)-(2x1) surface” T.J. Beck, A. Klust, M. Batzill, U. Diebold, C. Di Valentin, A. Tilocca, A. Selloni, *Surf. Sci. Lett.* **591**, L267 (2005).
31. “Gas phase-dependent properties of SnO₂ (110), (100), and (101) single crystal surfaces: structure, composition, and electronic properties” M. Batzill, K. Katsiev, J.M. Burst, U. Diebold, A.M. Chaka, B. Delley, *Phys. Rev. B* **72**, 165414 (2005).
32. **invited review article:** “The surface and materials science of tin oxide” M. Batzill, U. Diebold, *Prog. Surf. Sci* **79**, 47 (2005).
33. **invited:** “Cu growth on ZnO single crystal surfaces” O. Dulub, M. Batzill, U. Diebold *Topics Catal.* **36**, 65 (2005).
34. “Tuning the chemical response of a gas sensitive material: Water adsorption on SnO₂(101)” M. Batzill, W. Bergermayer, I. Tanaka, U. Diebold, *Surf. Sci. Lett.* **600**, L29 (2006).
35. “The influence of N-doping on the defect formation and surface properties of TiO₂ rutile and anatase” M. Batzill, E.H. Morales, U. Diebold *Phys. Rev. Lett.* **96**, 026103 (2006).
36. “Characterizing solid state gas responses by surface charging in photoemission: Water adsorption on SnO₂(101)” M. Batzill, U. Diebold *J. Phys.: Condens. Matter* **18**, L129-L134 (2006).
37. “Enhanced tunneling magnetoresistance and high-spin polarization at room temperature in polystyrene-coated Fe₃O₄ granular system” W. Wang, M. Yu, M. Batzill, J. He, U. Diebold, J. Tang *Phys. Rev. B* **73**, 134412 (2006).
38. “Steps on anatase TiO₂(101)” X.-Q. Gong, A. Selloni, M. Batzill, U. Diebold *Nature Materials* **5**, 665 (2006).

39. **invited:** “*Tuning surface properties of SnO₂(101) by reduction*” M. Batzill, K. Katsiev, J.M. Burst, Y. Losovyj, W. Bergermayer, I. Tanaka, U. Diebold, *J. Phys. Chem. Solids* **67**, 1923 (2006).
40. **invited review article:** “*Surface science studies of gas sensing materials: SnO₂*” M. Batzill, *Sensors* **6**, 1345 (2006).
41. **invited review article (featured as “hot article”):** “*Surface studies of gas sensing metal oxides*” M. Batzill, U. Diebold, *Chem. Phys. Phys. Chem.* in press, available online .
42. “*Growth of one-dimensional Pd nanoclusters on the terraces of a reduced SnO₂(101) surface*” Kh. Katsiev, M. Batzill, U. Diebold, B. Meyer, *Phys. Rev. Lett.* in press.
43. **invited article:** “*Surface studies of doped TiO₂*” M. Batzill, U. Diebold, *Chem. Phys.* submitted.

Book chapter

“*State-of-the-art characterization of single crystal surfaces- a view of nanostructures*”, M. Batzill, S. Banerjee, B.E. Koel in “*Catalysis and Electrocatalysis at Nanoparticle Surfaces*”, editors: A. Wieckowski, C. G. Vayenas, E. R. Savinova, Marcel Dekker Inc., New York (2003). ISBN: 0-8247-0879-2

Patent

“*Method for Patterning a Surface with Nanoscale Structures*”, M. Batzill, F. Bardou, K. J. Snowdon (UK patent application number 9901655.2 (1999)).

Invited Conference Presentations

1. “*Surface morphologies and structure of SnO₂*” **International Workshop on OXide surfaces 3 (IWOX3)**, Sapporo, Japan, Jan. 2003.
2. “*Surface and Interface properties of the reduced and stoichiometric SnO₂(101) surfaces*” **International workshop of the Center for Study of Materials under Extreme Conditions (CeSMEC)**, Miami Beach, Fl, Apr. 2005.
3. “*Surface Science and Chemistry of TiO₂*” **23rd European Conference on Surface Science (ECOSS-23)**, Berlin, Germany, Sept. 2005.
4. “*Surface properties of SnO₂(101)*” **2007 ACS Spring Meeting**, Chicago, March 2007.

Invited Seminars

1. “*Atomic-level probing of Sn and Sn-oxide on Pt(111)*”, **Osaka National Research Institute**, Osaka, Japan, Nov. 2000.
2. “*Comparisons between metal growth and alloying on Pt(111) and Pt(100)-hex surfaces*”, Surface and Interface Science Group at **Sandia National Laboratory**, Albuquerque, NM, USA, Aug. 2001.
3. “*Alloying at surfaces*” Department of Physics and Advanced Materials Research Institute, **University of New Orleans**, LA, USA, Nov. 2002.
4. “*Surface modification by alloying*” **Institut de Physique et Chimie des Matériaux de Strasbourg (CNRS)**, Strasbourg, France, Dec. 2002.
5. “*Surface science studies of thin film- and bulk- tin oxides*” Institut de Physique des Nanostructures, **Ecole Polytechnique Federale de Lausanne (EPFL)**, Lausanne, Switzerland, Dec. 2002.
6. “*Modification of Oxide Surfaces*” **Center for Functional Nanomaterials, Brookhaven National Laboratory**, Upton, NY, USA, Mar. 2006.

Contributed Presentations

1. Condensed Matter and Materials Physics Conference (CMMP '97)- Exeter, UK 1997.
"Fabrication of metallic nanowire arrays", M. Batzill, K.J. Snowdon.
2. IUVESTA 14th International Vacuum Congress (IVC-14) –Birmingham, UK 1998. *"Fabrication of Metallic and Magnetic Nano-Wires"* M Batzill, R Dunnett, M Sarstedt, K J Snowdon.
3. Condensed Matter and Materials Physics Conference (CMMP '98) – Manchester, UK 1998.
"Ion and electron beam stimulated desorption of fluorine from CaF₂ surfaces", M. Batzill, K.J. Snowdon.
4. ACS National Meeting- San Francisco, USA 2000
"SnO_x overlayer formation on Pt(111)", D.E. Beck, M. Batzill, B.E. Koel.
5. AVS 47th International Symposium – Boston, USA 2000.
"Ion beam assisted self-organization of periodic nanowire-arrays on CaF₂ substrates" M. Batzill, F. Bardou, K.J. Snowdon .
"Oxidation of Sn/Pt(111) surface alloys under UHV conditions- formation of ultrathin SnO_x films on Pt(111)" M. Batzill, D. Beck, B. E. Koel
6. STM01- Vancouver, Canada 2001.
"Surface modification by alloying- Ag, Sn, and Ge- Pt(100) surface alloys" M. Batzill, D. Beck, B. E. Koel.
7. IUVESTA 15th International Vacuum Congress (IVC-15), AVS 48th International Symposium (AVS-48), 11th International Conference on Solid Surfaces (ICSS-11) - San Francisco, USA 2001.
"Submonolayer Growth of Ag on Pt(100): Competition between Alloying and Surface Reconstruction" M. Batzill, B.E. Koel.
8. ACS National Meeting- Orlando, USA 2002
"Metal growth and alloying on Pt(111) and Pt(100)-hex surfaces"
B.E. Koel, M. Batzill.
9. APS- Indianapolis, USA 2002.
"Surface phenomena for alloy formation- submonolayer Ag and Ge on Pt(100)"
M. Batzill, T. Matsumoto, B. E. Koel.
10. EURESCO-Conference: Fundamental Aspects of Surface Science-Oxide Surfaces; Maretea, Italy, 2002.

“The influence of subsurface vanadium dopants on the chemical and electronic surface properties of TiO₂” M. Batzill, B. Katsiev, E. L. D. Hebenstreit, W. Hebenstreit, U. Diebold.

11. AVS 49th International Symposium-Denver, USA 2002.

“The influence of subsurface, charged impurities on the adsorption of chlorine at TiO₂(110)” M. Batzill, B. Katsiev, E. L. D. Hebenstreit, W. Hebenstreit, and U. Diebold.

12. ACS-National meeting- New Orleans, USA 2003.

a.) *“Influence of charged dopants in TiO₂ on the adsorption of Cl⁻”* T.J. Beck, M. Batzill, Kh. Katsiev, U. Diebold.

b.) *“Oxygen chemistry and stability of SnO₂ surfaces”* Kh. Katsiev, M. Batzill, U. Diebold.

13. AVS 50th International Symposium-Baltimore, USA 2003.

“Gas-phase dependent surface properties of SnO₂” M. Batzill, J. Burst, Kh. Katsiev, A. Chaka, U. Diebold.

14. Physical Electronics Conference- Davis, CA, USA 2004

“Gas-phase dependent surface properties of SnO₂” M. Batzill, J. Burst, Kh. Katsiev, A.M. Chaka, B. Delley, U. Diebold.

15. American Physical Society Meeting, Los Angeles, CA, USA 2005

“Surface electronic structure of the compositional variants of SnO₂(101)” M. Batzill, J. Burst, K. Katsiev, A. M. Chaka, B. Delley, U. Diebold.

16. AVS 52nd International Symposium-Boston, USA 2005.

“Controlling surface reactivity of SnO₂(101): Molecular and dissociative adsorption of water” M. Batzill, U. Diebold.

17. American Physical Society Meeting, Baltimore, USA 2006

a.) *“Dopant induced surface reconstruction in N-doped rutile TiO₂(110)”* M. Batzill, E. Morales, U. Diebold.

b.) *“Structure and energetics of step edges on anatase TiO₂(101)”* X.-Q. Gong, A. Selloni, M. Batzill, U. Diebold.

Professional Activities

- Co-organizer of two symposia at the American Chemical Society meeting in Chicago March 2007.
- Reviewer for research proposals to the Science Foundation Ireland (SFI), 2001.
- Reviewer for Physical Review B, Physical Review Letters, Nano Letters, Applied Physics Letters, European Physical Journal B, Journal of Crystal Growth, and Surface Science.
- Member of the American Physical Society (APS), American Vacuum Society (AVS), American Chemical Society (ACS), and Deutsche Physikalische Gesellschaft (German Physical Society) (DPG).

Awards and Fellowships

Research fellowship of the German Research Council (DFG), 2000;

Runcorn Prize for best PhD-thesis in the Department of Physics at the University of Newcastle, 1999.

Teaching Experience

- PHYS 121 Introductory Physics (algebra based) (Tulane)
- PHYS 131 General Physics (calculus based) (Tulane)
- PHYS 360/ PHYS 660 Nanoscience and –technology (Combined undergraduate/ graduate course) (Tulane)
- Materials Physics I (USF)
- Materials Physics II (USF)