

Robert Szoszkiewicz

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EDUCATION

Ph. D. in Nanoscale Physics	10/03
Swiss Federal Institute of Technology in Lausanne (EPFL), Switzerland	
M. Sc. in Soft Matter Physics, Jagiellonian University, Cracow, Poland	1999
Eight out of ten semesters completed towards M. Sc. in Biological Chemistry	1999
Jagiellonian University, Cracow, Poland	
Student scholar - undergrad/grad level, Boston College, MA	1998

RESEARCH EXPERIENCE

- Post-doc at Biological Sciences, **Columbia University**, NY from 1/07
 - Synthesized and expressed two novel polyprotein constructs for using them as a template in measuring the strength of a single bond.
 - Adopted rigorous methods to analyze a single molecule mechanochemical reaction
 - Built an optimized AFM setup for single-molecule force-clamp spectroscopy of proteins.
- Post-doc at Physics, **Georgia Institute of Technology**, Atlanta, GA 1/04 - 12/06
 - Developed a novel, high-speed (> 1 mm/s) thermochemical nanolithography with sub-15 nm feature size, and studied dynamics of locally heated polymers (formation of ripples).
 - Participated in a proposal, "Investigating Chemical Reactivity on Surfaces with High Spatial Resolution - Thermochemical Nanolithography".
 - Studied rheology and friction of water confined in sub-nanometer gaps (applications include biological ion channels).
 - Found that nanoscopic capillary bridges (like these in MEMS and NEMS) need up to a few milliseconds to nucleate.
 - Proved that a water phase diagram is the same at nano- and macro- scales.
 - Helped to set up an AFM lab.
- Research Assistant, **Swiss Federal Institute of Technology in Lausanne** 9/99 - 11/03
 - Addressed correlations between local adhesion hysteresis and friction in the cases of some engineering materials, and some proteins.

TEACHING EXPERIENCE

- Georgia Tech: Instructor of the scanning probe microscopy (trained 12 graduate and undergraduate students), mentored three REU students.
- EPFL: Graduate Teaching Assistant for physics and material science students at metrology classes, and introductory laboratory sections on optics, thermodynamics, magnetism, electrostatics, solid state physics, material science, and aerodynamics.

TECHNICAL QUALIFICATIONS, SKILLS

Skilled at Atomic Force Microscopy (AFM), AFM-based Ultrasonic Microscopies, Nanoindentation techniques, Heterodyne Interferometry, Scanning Electron Microscopy (SEM), Scanning Tunneling Microscopy (STM), Quartz Crystal Microbalance (QCM), Fluorescence Microscopy, Infra-red and Raman Microscopy (IR, R), Differential Scanning Calorimetry (DSC), as well as Dielectric Spectroscopy (DS).

AWARDS

Student Scholar of the Polish Ministry of National Education	10/97 - 7/98
Prize Exchange Student Scholar, Boston College, MA	1/98 - 6/98
Student Scholar of the Polish Ministry of National Education	10/96 - 7/97

MEMBERSHIP

NSF Center for Materials & Devices for Information Technology Research, APS, AAAS, MRS, European Phantoms Nanotechnology Network

VARIA

Co-organized *I Symposium* for Natural Science Students, Cracow, Poland (1997).

Reviewer, Langmuir, Nanotechnology, Journal of Physics D: Applied Physics, Modeling and Simulation in Materials Science and Engineering, Measurements Science and Technology

PATENTS

1. **R. Szoszkiewicz**, T. Okada, T.-D. Li, W. P. King, S. C. Jones, S. R. Marder and E. Riedo, *Chemical Nanolithography by Means of Local Heating through an Atomic Force Microscope Tip* - provisional patent filed (9/06) and extended (9/07).

PUBLISHED PAPERS (in reverse order)

16. **R. Szoszkiewicz**, S. R. K. Ainavarapu, A. P. Wiita, R. Perez-Jimenez and J. Fernandez, *Dwell time analysis of a single molecule mechanochemical reaction*, *Langmuir*, **24**, 1356 (2008)
15. D. Wang, **R. Szoszkiewicz**, T. Okada, S. C. Jones, M. Lucas, W. P. King, S. R. Marder and E. Riedo, *Local wettability modification by thermochemical nanolithography with write-read-overwrite capability*, *Applied Physics Letters*, **91**, 243104 (2007)
14. S. Yoo, W. J. Potscavage Jr., B. Domercq, S.-H. Han, T.-D. Li, S. Jones, **R. Szoszkiewicz**, D. Levi, E. Riedo, S. R. Marder and B. Kippelen, *Analysis of improved photovoltaic properties of pentacene/C₆₀ organic solar cells: Effects of exciton blocking layer thickness and thermal annealing*, *Solid-State Electronics*, **51**, 1367 (2007)
13. **R. Szoszkiewicz**, T. Okada, S. C. Jones, T.-D. Li, W. P. King, S. R. Marder and E. Riedo, *High-speed, thermochemical nanolithography with sub-15 nm feature size*, *Nano Letters*, **7**(4), 1064 (2007)

Selected by the Virtual Journal of Nanoscale Science & Technology
Media coverage by Georgia Tech press release and many external (e.g., Science Daily, Scientific American).

12. T.-D. Li, J. Gao, **R. Szoszkiewicz**, U. Landman and E. Riedo, *Structured and viscous water in sub-nanometer gaps*, *Physical Review B* **75**, 115415 (2007)
Selected by the Virtual Journal of Biological Physics Research
Media coverage by Georgia Tech press release and many external (e.g., ChemLin).
11. L. Sirghi, **R. Szoszkiewicz**, E. Riedo, *Volume of a nanoscale water bridge*, *Langmuir* **22**, 1093 (2006)
10. **R. Szoszkiewicz**, B. Bhushan, B. D. Huey, A. J. Kulik, G. Gremaud, *Adhesion hysteresis and friction at nanometer and micrometer lengths*, *Journal of Applied Physics* **99**, 014310 (2006)
9. **R. Szoszkiewicz**, E. Riedo, *Nucleation time of nanoscale water bridges*, *Physical Review Letters* **95**, 135502 (2005)
Selected by the Virtual Journal of Nanoscale Science & Technology
Media coverage by Georgia Tech press release and many external (e.g., NanotechWeb).
8. **R. Szoszkiewicz**, E. Riedo, *Nanoscale friction as a probe of local phase transitions*, *Applied Physics Letters* **87**, 033105 (2005)
Selected by the Virtual Journal of Nanoscale Science & Technology.
7. **R. Szoszkiewicz**, B. Bhushan, B. D. Huey, A. J. Kulik, G. Gremaud, *Correlations between adhesion hysteresis and friction at molecular scales*, *Journal of Chemical Physics* **122**, 144708 (2005)
Selected by the Virtual Journal of Nanoscale Science & Technology.
6. **R. Szoszkiewicz**, A. J. Kulik, G. Gremaud, *Quantitative measure of nanoscale adhesion hysteresis by ultrasonic force microscopy*, *Journal of Chemical Physics* **122**, 134706 (2005)
Selected by the Virtual Journal of Nanoscale Science & Technology.
5. **R. Szoszkiewicz**, A. J. Kulik, G. Gremaud, M. Lekka, *Probing local water contents of in vitro protein films by ultrasonic force microscopy*, *Applied Physics Letters* **86**, 123901 (2005)
Selected by the Virtual Journal of Biological Physics Research.
4. B. D. Huey, C. Ramanujan, M. Bobji, J. Blendell, G. White, **R. Szoszkiewicz**, A. J. Kulik, *The importance of distributed loading and cantilever angle in piezo-force microscopy*, *Journal of Electroceramics* **13**, 287 (2004)
3. **R. Szoszkiewicz**, G. Gremaud, B. D. Huey, A. J. Kulik, *How ultrasound can help with connecting friction and adhesion hysteresis at local scales*, *Acoustical Imaging* **27**, 733-740 (2004)
2. G. Rochat, Y. Leterrier, C. J. G. Plummer, J. A. E. Manson, **R. Szoszkiewicz**, A. J. Kulik, P. Fayet, *Effect of substrate crystalline morphology on the adhesion of plasma enhanced chemical vapor deposited thin silicon oxide coatings on polyamide*, *Journal of Applied Physics* **95**, 5429 (2004)
1. **R. Szoszkiewicz**, B. D. Huey, O. V. Kolosov, G. A. D. Briggs, G. Gremaud, A. J. Kulik, *Tribology and ultrasonic hysteresis at local scales*, *Applied Surface Science* **210**, 54 (2003)

BOOK CHAPTERS (in reverse order)

2. L. Merchan, **R. Szoszkiewicz**, E. Riedo, *NanoMechanics: elasticity in nano-objects* in Fundamentals of friction and wear - Springer Book, p. 219-254, edited by E. Meyer and E. Gnecco, Springer-Verlag, Heidelberg, 2006
1. **R. Szoszkiewicz**, E. Riedo, *New AFM developments to study elasticity and adhesion at the nanoscale* in Applied Scanning Probe Methods V, p. 269-286, edited by B. Bhushan, H. Fuchs, and S. Kawata, Springer-Verlag, Heidelberg, 2006

INVITED PRESENTATIONS

1. **R. Szoszkiewicz**, T.-D. Li, J. Gao, L. Sirghi, T. Okada, S. C. Jones, W. P. King, S. R. Marder U. Landman, E. Riedo, *Local capillaries of water and water confined at sub-nanometer gaps: a prelude to bioinspired surfaces*, invited seminar, National Institute of Standards and Technology, Gaithersburg, MD, 2007
2. **R. Szoszkiewicz**, T.-D. Li, J. Gao, L. Sirghi, T. Okada, S. C. Jones, W. P. King, S. R. Marder U. Landman, E. Riedo, *Local capillaries of water and water confined at sub-nanometer gaps: a prelude to bioinspired surfaces*, invited seminar, Wayne State University, MI, 2007
3. **R. Szoszkiewicz**, T.-D. Li, J. Gao, L. Sirghi, U. Landman, E. Riedo, *Water at local scales*, colloquium, Brookhaven National Lab, Upton, NY, 2006
4. **R. Szoszkiewicz**, B. Bhushan, B. D. Huey, A. J. Kulik, G. Gremaud, *Correlations between adhesion hysteresis and friction at local scales*, invited seminar, Fraunhofer Society, IZFP, and University of Saarbrücken, Germany, 2003
5. **R. Szoszkiewicz**, J. K. Mościcki, *Dielectric Spectroscopy in investigating dynamics of an organic glass orthoterphenyl*, invited seminar, Swiss Federal Institute of Technology, Lausanne, Switzerland, 1999

CONTRIBUTED PRESENTATIONS (only oral listed, 10+ posters in addition)

1. **R. Szoszkiewicz**, T. Okada, E. Gnecco, W. King, S. Marder, E. Riedo *Polymer dynamics at local scales: origin of ripples formation*, APS March Meeting, Baltimore, MD, 2006
2. **R. Szoszkiewicz**, E. Riedo, T.-D. Li, J. Gao, U. Landman *Formation of nanoscale water bridges*, APS March Meeting, Baltimore, MD, 2006
3. **R. Szoszkiewicz**, E. Riedo, *Friction force microscopy as a tool to probe local phase transitions*, MRS Fall Meeting, Boston, MA, 2005
4. **R. Szoszkiewicz**, E. Riedo, *Water at the nanoscale*, Condensed Matter Seminar Series, Georgia Institute of Technology, Atlanta, 2005
5. **R. Szoszkiewicz**, E. Riedo, *Nanoscale capillary bridges investigated by friction force microscopy*, Center of Nonlinear Science Seminars, Georgia Institute of Technology, Atlanta, 2005
6. **R. Szoszkiewicz**, E. Riedo, *Friction force microscopy as a tool to probe local phase transitions*, 23rd European Conference on Surface Science, Berlin, Germany, 2005
7. **R. Szoszkiewicz**, B. Bhushan, B. D. Huey, A. J. Kulik, G. Gremaud, *Adhesion hysteresis and its correlations with friction*, 7th International Non-contact Atomic Force Microscopy Conference, Seattle, WA, 2004
8. **R. Szoszkiewicz**, B. D. Huey, G. Gremaud, A. J. Kulik, *How can ultrasounds help with connecting friction and adhesion at local scales*, 27th International Symposium on Acoustical Imaging, Saarbrücken, Germany, 2003
9. **R. Szoszkiewicz**, B. D. Huey, G. Gremaud, A. J. Kulik, *How can ultrasounds help with connecting friction and adhesion at local scales*, Swiss Physical Society Annual Meeting, Basel, Switzerland, 2003

10. **R. Szoszkiewicz**, B. D. Huey, D. V. Kolosov, G. A. D. Briggs, G. Gremaud and A. J. Kulik, *Adhesion hysteresis and ultrasonic force microscopy*, 3rd International Symposium on Tribochemistry, Cracow, Poland 2001
11. **R. Szoszkiewicz**, G. Gremaud, O. V. Kolosov, B. D. Huey, G. A. D. Briggs, A. J. Kulik, *Jumping off, jumping on - principles of ultrasonic force microscopy*, Mini-Symposium on Son et Lumiere, Grasmere, United Kingdom, 2000
12. **R. Szoszkiewicz**, J. K. Mościcki, *Viscosity of discotic liquid crystals*, 12th International Conference for Physics Students, Vienna, Austria, 1997