

Stoyan Smoukov

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EDUCATION

8/95 - 12/01

7/91 - 7/95

- **Ph.D.** in Chemistry (December, 2001), **M.S.** in Chemistry (December, 1996)
Northwestern University, Evanston, IL
- **B.S.** in Chemistry/Mathematics, Magna Cum Laude
University of Richmond, Richmond, VA

PROFESSIONAL EXPERIENCE

7/08 – present

Research Asst.

Professor

10/07 – 6/08

Visit. Asst. Prof.

- **NC State University, Chem.Eng.**, Raleigh, NC
- Investigating Janus particle assemblies by magnetic fields. The responsive structures are stable in the absence of fields, but can disassemble on command.
- Discovered a solution-spinning route to nanofibers – currently an unsolved commercial problem. Adapting the method to industrially relevant materials.
- Investigating superstabilization of emulsions and foams by polymeric particles.
- Leading a project on food additive formulations with an industrial collaborator.

2/04 – 9/07

Research

Associate

- **Northwestern University, Chemical Engineering**, Evanston, IL
- Lead several projects in 2D electrostatic self-assembly, with patent-pending applications ranging from antibacterial coatings to nanoparticles membranes.
- Co-developed a one-step non-lithographic alternative to multistep etching in semiconductors, demonstrated complex patterns with horiz. resolution $\geq 300\text{nm}$
- Harnessed reaction-diffusion processes to create non-binary topographic patterns with tens of nanometers height resolution.
- Contributed strong analytical/instrumentation skills to a number of multi-disciplinary projects.

3/02 - 11/03

Senior Research

Associate

- **Illinois Institute of Technology, Chemical Engineering Dept.**, Chicago, IL
- Developed an optical setup to measure very accurately the mass diffusivity in polymers using the non-invasive Forced Rayleigh Light Scattering technique.
- Led a group project for mass and thermal diffusion in polymers in static and controlled flow environments.
- Combined measurements from laser spectroscopy and rheology – light scattering, birefringence, interferometry, and rheometry in a custom-built instrument to verify a new property relationship – the stress-thermal rule.

01/02-03/02

Post-Doctoral

Research

- **Northwestern University, Chemistry Department**, Evanston, IL
- Discovered a key error in the DNA sequence of a mutant gene which had gone undetected in the lab for years; result will help electron-transfer research.
- Used a number of Molecular Biology techniques (PCR, plasmid sequencing)

8/95 - 12/01

Ph.D. Research

- **Northwestern University, Chemistry Department**, Evanston, IL
- Discovered structure of active sites, mechanism in important metalloenzymes.
- Used and developed magnetic resonance spectroscopy simulation programs.
- Initiated and wrote a sample inventory database. Persuaded peers, superiors of the need for the project; developed a robust and “user-friendly” design.

GRANT SUPPORT

- Co-PI, NSF proposal on “A New Paradigm for Scalable Fabrication of Polymer Nanofibers by Bulk Shear and Phase Separation”, March 2009, (funded)

**GRANT
SUPPORT
(continued)**

- Co-PI, Unilever Plc, corporate R&D grant to study “Fibers and rodlike stabilizers for food-grade emulsions”, September 2009 (pending)
- Co-PI, industrial consortium proposal “Scalable Wet-spinning of Nanofibers”, March 2009
- Co-PI, NSF-GOALI collaborative proposal with Prof. Velev and Advanced Liquid Logic, Inc. on “Superstabilized Droplets and Their Manipulation in a Digital Microfluidics Platform with Reusable Bioassay Chips”, Sept. 2008
- Co-PI on proposal with Profs. Velev and Pourdeyhimi based on my work at NC State: “Development of a Novel Efficient and Scalable Process for Shear-driven Nanospinning of Micron-Diameter Fibers and Nonwoven Textiles”
- Co-PI with Prof. Grzybowski on NSF proposal to investigate “Fundamental Properties & Applications of Electrostatically ‘Patchy’ Nanoparticle Coatings”
- PI, proposal to recycle Northwestern U. cafeteria oil as fuel, 2007 (funded)

**TEACHING AND
MANAGEMENT**

10/08-current
01/09 - 05/09

- Lead various research teams of undergraduate, Master’s and Ph.D. students at NCSU, Northwestern University and IIT during my post-doctoral work.

- Mentor for the NC State Initiative for Maximizing Student Diversity (IMSD).
- NCSU – co-instructor, organizer for *CHE596D: Special Topics in Nanoscience*
- NCSU – taught lectures in *CHE312 Transport Processes II*
- NCSU – guest lecturer in *CHE462 Colloids and Nanoscale Engineering*
- NCSU – leading an active learning session in *CHE596I – Colloid Science and Nanoscale Engineering*, with both traditional and distance education students
- Northwestern U.: Lecturer and consultant for the *IDEA 298/398 Design classes*
- One of very few, select students to assist in the teaching of a graduate Quantum Mechanics and a high level undergraduate Thermodynamics classes
- Teaching assistant for General Chemistry

10/08 - 12/08

10/06 - 05/07
10/97 - 05/99

10/95 - 05/97

**AFFILIATIONS
AND SERVICE**

- Reviewer for the Journal of Physical Chemistry, Langmuir, Angewandte Chemie – International Edition
- Member – American Institute of Chemical Engineers, Materials Research Society, American Chemical Society, Society of Rheology.
- Honorary Memberships: Phi Beta Kappa, Pi Mu Epsilon (math), Gamma Sigma Epsilon (chemistry), Golden Key Honor Society, PLU, Phi Eta Sigma, Phi Beta Delta (International scholars), University Scholar 1991-1995

**AWARDS AND
SCIENTIFIC
IMPACT**

- Interdisciplinary Network of Emerging Science and Technologies (INEST) fellowship – 2007
- **Citations: h-index = 12**, total citations 480.

REFERENCES

- Letters of reference available upon request.

Resume Supplement - List of Publications

PATENTS PENDING

Smoukov SK et al., Methods of Coating Surfaces with Nanoparticles and Nanoparticle-Coated Surfaces, U.S. Patent application 20090098366, filed Sept 08, 2008

Smoukov SK et al., Nanospinning of Polymer Fibers from Sheared Solutions, Provisional U.S. Patent, filed Mar 24, 2009

REFEREED JOURNAL ARTICLES

30. Smoukov SK, Shim E, Pourdeyhimi B, Marquez, M., Velev OD, Scalable formation of polymer nanofibers from sheared solutions, manuscript in preparation.

29. Kowalczyk B, Apodaca MM, Nakanishi H, Smoukov SK, Grzybowski BA, Lift-off and Micropatterning of Mono- and Multilayer Nanoparticle Films, *SMALL*, **5** (17), 1970-1973 (2009)

28. Kowalczyk B, Bishop KJM, Smoukov SK, Grzybowski BA, Synthetic popularity reflects chemical reactivity, *J. PHYS. ORG. CHEM.*, **22** (9), 897-902 (2009)

27. Smoukov SK, Gangwal S, Marquez M, Velev OD, Reconfigurable Responsive Structures Assembled From Magnetic Janus Particles, *SOFT MATTER*, **5** (6), 1285-1292 (2009)

26. Klajn, R., Gray, T.P., Wesson, P.J., Myers, B.D., Dravid, V.P., Smoukov, S.K. & Grzybowski, B.A. Bulk Synthesis and Surface Patterning of Nanoporous Metals and Alloys from Supraspherical Nanoparticle Aggregates, *ADV. FUNCT. MATER.*, **18** (18), 2763 - 2769 (2008).

25. Mahmud G, Bishop KJM, Chegel Y, Smoukov SK, Grzybowski BA, Wet-stamped precipitant gradients control the growth of protein microcrystals in an array of nanoliter wells, *J. AM. CHEM. SOC.*, **130** (7), 2146-2147 (2008)

24. Smoukov SK, Bishop KJM, Kowalczyk B, Kalsin AM, Grzybowski BA, Electrostatically "patchy" coatings via cooperative adsorption of charged nanoparticles, *J. AM. CHEM. SOC.*, **129** (50), 15623-15630 (2007)

23. Paszewski, M., Smoukov, SK, Klajn, R., Grzybowski B.A. Multilevel Surface Nano- and Microstructuring via Sequential Photoswelling of Dichromated Gelatin, *LANGMUIR*, **23** (10), 5419-5422 (2007)

22. Kalsin AM, Kowalczyk B, Smoukov SK, Klajn R, Grzybowski BA: Ionic-like behavior of oppositely charged nanoparticles, *J. AM. CHEM. SOC.*, **128** (47), 15046-15047 (2006)

21. Smoukov SK, Grzybowski BA: Maskless microetching of transparent conductive oxides (ITO and ZnO) and semiconductors (GaAs) based on reaction-diffusion, *CHEM. MATER.* **18** (20), 4722-4723 (2006)

20. Kalsin AM, Pinchuk AO, Smoukov SK, Paszewski M, Schatz GC, Grzybowski BA: Electrostatic aggregation and formation of core-shell suprastructures in binary mixtures of charged metal nanoparticles, *NANO LETT.*, **6** (9), 1896-1903 (2006)

19. Campbell CJ, Smoukov SK, Bishop KJM, Baker E, Grzybowski BA: Direct printing of 3D and curvilinear micrometer-sized architectures into solid substrates with sub-micrometer resolution, *ADV. MATER.*, **18** (15), 2004-2008 (2006)

18. Kalsin AM, Fialkowski M, Paszewski M, Smoukov SK, Bishop KJM, Grzybowski BA: Electrostatic Self-Assembly of Binary Nanoparticle Crystals with a Diamond-Like Lattice, *SCIENCE*, **312** (5772), 420-424 (2006).
17. Fialkowski M, Bishop KJM, Klajn R, Smoukov SK, Campbell CJ, Grzybowski BA: Principles and implementations of dissipative (dynamic) self-assembly, *J. PHYS. CHEM. B* **110** (6), 2482 (2006)
16. Smoukov SK, Bitner A, Campbell CJ, Kandere-Grzybowska K, Grzybowski BA: Nano- and microscopic surface wrinkles of linearly increasing heights prepared by periodic precipitation, *J. AM. CHEM. SOC.* **127** (50), 17803 (2005)
15. Grzybowski BA, Bishop KJM, Campbell CJ, Fialkowski M, Smoukov SK: Micro- and nanotechnology via reaction-diffusion, *SOFT MATTER* **1**(2), 114 (2005)
14. Balasubramanian V, Bush K, Smoukov S, Venerus DC, Schieber JD: Measurements of flow-induced anisotropic thermal conduction in a polyisobutylene melt following step shear flow, *MACROMOLECULES*, **38** (14): 6210 (2005)
13. Campbell CJ, Baker E, Fialkowski M, Bitner A, Smoukov SK, Grzybowski BA: Self-organization of planar microlenses by periodic precipitation, *J. APPL. PHYS.*, **97** (12), Art. No. 126102 (2005)
12. Smoukov SK, Bishop KJM, Klajn R, Campbell CJ, Grzybowski BA: Cutting into solids with micropatterned gels, *ADV. MATER.* **17** (11), 1361 (2005)
11. Bitner A, Fialkowski M, Smoukov SK, Campbell CJ, Grzybowski BA: Amplification of changes of a thin film's macromolecular structure into macroscopic reaction-diffusion patterns, *J. AM. CHEM. SOC.* **127** (19), 6936 (2005)
10. Campbell CJ, Smoukov SK, Bishop KJM, Grzybowski BA: Reactive surface micropatterning by wet stamping, *LANGMUIR* **21** (7), 2637 (2005)
9. Smoukov SK, Bishop KJM, Campbell CJ, Grzybowski BA: Freestanding three-dimensional copper foils prepared by electroless deposition on micropatterned gels, *ADV. MATER.* **17** (6), 751 (2005)
8. Davydov R, Behrouzian B, Smoukov S, Stubbe J, Hoffman BM, Shanklin J: Effect of substrate on the diiron(III) site in stearyl acyl carrier protein Delta(9)-desaturase as disclosed by cryoreduction electron paramagnetic resonance/electron nuclear double resonance spectroscopy, *BIOCHEMISTRY* **44** (4), 1309 (2005)
7. Klajn R, Fialkowski M, Bensemann IT, Bitner A, Campbell CJ, Bishop K, Smoukov S, Grzybowski BA: Multicolour micropatterning of thin films of dry gels, *NATURE MATER.* **3** (10), 729 (2004)
6. Schieber JD, Venerus DC, Bush K, Balasubramanian V, Smoukov S: Measurement of anisotropic energy transport in flowing polymers by using a holographic technique, *PROC. NAT. ACAD. SCI. USA* **101** (36), 13142 (2004)

5. Venerus DC, Schieber JD, Balasubramanian V, Bush K, Smoukov S: Anisotropic thermal conduction in a polymer liquid subjected to shear flow, *PHYS. REV. LETT.* **93** (9), Art. No. 098301 (2004)
4. Smoukov SK, Davydov RM, Doan PE, Sturgeon B, Kung IY, Hoffman BM, Kurtz DM: EPR and ENDOR Evidence for a 1-His, Hydroxo-Bridged Mixed-Valent Diiron Site in *Desulfovibrio vulgaris* Rubrerythrin, *BIOCHEMISTRY* **42** (20): 6201-6208 (2003)
3. Smoukov SK, Kopp DA, Valentine AM, Davydov R, Lippard SJ, Hoffman BM: Product Binding to the Diiron(III) and Mixed-Valence Diiron Centers of Methane Monooxygenase Hydroxylase Studied by ^1H and ^{19}F ENDOR Spectroscopy, *J AM CHEM SOC* **124** (11), 2657-2663 (2002)
2. Smoukov SK, Quaroni L, Wang XD, Doan PE, Hoffman BM, Que L: ENDOR spectroscopic evidence for a hydroxo-bridge nucleophile involved in catalysis a dinuclear hydrolase, *J AM CHEM SOC* **124** (11), 2595-2603 (2002)
1. Smoukov SK, Telser J, Bernat BA, Rife CL, Armstrong RN, Hoffman BM: EPR study of substrate binding to the Mn(II) active site of the bacterial antibiotic resistance enzyme FosA: A better way to examine Mn(II), *J AM CHEM SOC* **124** (10): 2318-2326 (2002).