

Brian G. Prevo

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Education

- Ph.D., Chemical Engineering, North Carolina State University (NCSU), Raleigh, NC November, 2005
- M.S., Chemical Engineering, North Carolina State University, Raleigh, NC December, 2003
- B.S., Chemical Engineering, University of California - Davis (UCD), Davis, CA June, 2001

Awards and honors

- Outstanding graduate student teacher award, NCSU (2004-2005)
- 3rd place, NCSU ChE intradepartmental Schoenborn oral presentation competition (2004)
- Outstanding graduate student teacher award, NCSU (2001-2002)
- 3rd place, NCSU ChE intradepartmental Schoenborn poster session (fall 2002)
- AIChE (Northern California Section) Outstanding Senior Award, for UCD ChE (2001)
- Outstanding senior award from the college of engineering at UCD (2000)
- Recipient of Dow Chemical Outstanding Junior Award, for UCD ChE (1999)

Research interests

- Colloidal science and engineering: particle synthesis, modification, and self-assembly; colloidal scale manipulation via evaporation induced convective assembly and dielectrophoretic (applied AC fields) assembly
- Chemical physics: interactions of materials with electromagnetic radiation (e.g. surface plasmons, photonic band gaps, and anti-reflectivity)
- Applications: Functional coatings, nanocomposites, biosensors, drug delivery and microfluidics

Research experience

Colloid assembly via hydrodynamic forces

- Designed apparatus for depositing colloidal coatings from microliter droplets of colloidal suspension using convective assembly (e.g. evaporation induced self assembly)
- Fundamental exploration of the relationship between coating process parameters and coating structure and properties (characterization tools: optical microscopy, SEM, AFM, ellipsometry, spectrophotometry)
- Deposition of colloidal coatings from aqueous, organic, and liquid and supercritical CO₂
- Synthesis of polymer microrods, metallic nanoparticles, and two phase arrested growth synthesis of sterically capped nanoparticles

Colloid assembly and manipulation via applied electric fields

- Investigated dielectrophoretic control over microdroplets floating in a more dense fluorinated oil using a liquid-liquid microfluidic chip in which the drops are controlled by electrodes submerged beneath the oil phase
- Advised continuing experiments on these chips for synthesizing various colloidal supraparticles

Additional research experience prior to graduate school

- REU at UMASS, Amherst Polymer Science and Engineering Dept (2000) under prof. Tom Russell: studied synthetic "leucine zipper" protein gelation kinetics (in hydrogels) by FRET fluorescence spectrometry
- Summer intern at Dow Chemical Research and Development Department in Freeport, TX (1999): studied correlation between polymer resin quality and pressure drop across the extruder die during melt processing

Teaching experience

- Teaching Assistant (TA), graduate level ChE course (fall 2004, sum & fall 2005): ChE 713 – *Thermodynamics*
- Research mentor (sum 2005), through Alliances for Graduate Education and the Professoriate (AGEP) program
- Research mentor (sum 2003), through NSF Green Processing Undergraduate Research Program
- Teaching Assistant (TA), undergraduate ChE course (2001-2002): ChE 205 – *Intro to mass & energy balances*

Activities

- Member AIChE (2005)
- Member MRS (2003-05)
- President of ChE-GSA at NCSU (2002-2003)
- Chemical Engineering Dept. recruiting captain for future graduate recruitment (2003)
- NSF-STC (CO2 Center) weekly net-meeting moderator (summer 2003)
- Avid golfer and intramural sports enthusiast
- President of undergraduate UCD chapter of AIChE (1999-2000)
- Member UCD chapter TBII honor society (1997-2001); Secretary (1999-2000)
- Played on the UCD men's varsity intercollegiate golf team (1996-1998)

K-12 Outreach

- NCSU Science House volunteer: basic chemistry and engineering demos for kids ages 5 – 18 (2003 – current)
- NCSU ChE Dept. host for Student Introduction to Engineering (SITE) camp (Sum 2003, '04)
- Tutored high school students in math, physics and chemistry (1997 – 2001)

Publications

Colloid assembly via hydrodynamic forces

- Kuncicky, D. M.; Prevo, B. G.; and Velev, O. D.; “Controlled Assembly of SERS Substrates Templated by Colloidal Crystal Films,” *Journal of Materials Chemistry*. (2005) In press.
- Yuan, Z., Petsev, D. N., Prevo, B. G., Velev, O. D., Atanassov, P.; “Direct Assembly of Two-Dimensional Silica Encapsulated Iron Oxide Nanoparticles Arrays Derived from Ferritin Monolayers”, (2005) Accepted.
- Prevo, B. G., Hwang, Y., and Velev, O. D.; “Convective Assembly of Antireflective Silica Coatings with Controlled Thickness and Refractive Index,” *Chemistry of Materials*. (2005) **17**, 3642 – 3651.
- Finkel, N. H., Prevo, B. G., Velev, O. D., and He, L; “Ordered Silicon Nanopores for Desorption/Ionization on Porous Silicon Mass Spectrometry (DIOS-MS)”, *Analytical Chemistry* (2005) **77**, 1088-1095.
- Prevo, B. G., Fuller, III, J., and Velev, O. D.; “Rapid Deposition of Gold Nanoparticle Films with Controlled Thickness and Structure by Convective Assembly”, *Chemistry of Materials* (2005) **17**, 28 – 35.
- Prevo, B. G. and Velev, O. D.; “Controlled Rapid Deposition of Structured Coatings from Micro- and Nanoparticle Suspensions”, *Langmuir* (2004) **20**, 2009-2108.

Colloid assembly and manipulation via applied electric fields

- Millman, J. R., Bhatt, K. H., Prevo, B. G., and Velev, O. D.; “Anisotropic particle synthesis using dielectrophoretically controlled droplet microreactors”, *Nature Materials* (2005) **4**, 98-102.
- Velev, O. D., Prevo, B. G., and Bhatt, K. H.; “On-chip Manipulation of Free Droplets”, *Nature* (2003) **426**, 515-516.

Conference Presentations

- AIChE Fall Meeting (2005, Cincinnati, OH). *Controlled Deposition and Modification of Antireflective Coatings from Silica Nanoparticles* Brian G. Prevo, Yeon Hwang, Jim McClain, Ruben Carbonell, and Orlin D. Velev
- Invited seminar (Sept. 05, Wright Patterson Airforce Research Labs, Dayton, OH) *Engineered Deposition of Functional Coatings from Micro-and Nanoparticles*
- MRS Spring Meeting (2005, San Francisco, CA). *Assembly of complex microparticle and nanoparticle structures in on-chip microdroplet reactors*. Orlin D. Velev, Jeffrey Millman, SukTai Chang, Ketan Bhatt, Brian Prevo.
- MRS Spring National Conference (Mar. 2005, San Francisco). *Controlled deposition and modification of conductive and antireflective nanoparticle coatings*. Brian G. Prevo, Yeon Hwang, J. C. Fuller, Orlin D. Velev.
- 227th ACS National Meeting (2004, Anaheim, CA). *On-chip dielectrophoretic manipulation of droplets for assembly of microparticle and nanoparticle structures*. Orlin D. Velev, Ketan Bhatt, Brian Prevo, David Woolard, Jeffrey Millman.
- 227th ACS National Meeting (2004, Anaheim, CA). *Colloidal assembly: Toolbox for biomolecular organization and electric interfacing*. Orlin D. Velev, Ketan Bhatt, Brian Prevo, David Woolard, Jeffrey Millman.

- 78th ACS Colloid and Surface Science Symposium (June 2004, Yale University). *Rapid and controllable deposition of colloidal crystal coatings from microspheres and nanoparticles*. Brian G. Prevo, Yeon Hwang, Ruben G. Carbonell, Orlin D. Velev.
- Surfactants and Colloids Workshop (May 2004, University of Hull, England). *Controlled deposition and modification of coatings from microspheres and nanoparticles*. Brian G. Prevo, Orlin D. Velev.
- Annual Fall Meeting MRS (2003, Boston, MA). *On-chip dielectrophoretic manipulation of droplets for assembly of microparticle and nanoparticle structures*. Orlin D. Velev, Brian Prevo, Ketan Bhatt.
- Annual Spring Meeting MRS (2003, San Francisco, CA). *Fast deposition of micro – and nanoparticle coatings*. Brian G. Prevo, Ruben G. Carbonell, Orlin D. Velev.
- AIChE Fall Meeting (2003, San Francisco, CA). *Fast deposition of structured coatings from microspheres and nanoparticles*. Brian G. Prevo, Ruben G. Carbonell, Orlin D. Velev.
- AIChE Fall Meeting (2003, San Francisco, CA). *Dielectrophoretic on-chip manipulation and characterization of microparticles, nanoparticles, and droplets*. Orlin D. Velev, Ketan Bhatt, Brian Prevo, Eric Kaler, Simon Lumsdon.
- AIChE Fall Meeting (2003, San Francisco, CA). *Electrostatic and dielectrophoretic manipulation of freely suspended droplets for microfluidic applications*. Orlin D. Velev, Brian Prevo, Ketan Bhatt.
- Annual Fall Meeting AIChE (2003, San Francisco, CA) *Formation of Two-Dimensional Ferritin Arrays and Nanocoatings on Solid Surfaces*. Yuan “Cherry” Zuan, Plamen Atanassov, Brian Prevo, Orlin Velev
- Annual Fall Meeting AIChE (2003, San Francisco, CA). *Dielectrophoretic on-chip manipulation and characterization of microparticles, nanoparticles and droplets*. Orlin D. Velev, Brian G. Prevo, Ketan H. Bhatt
- 5th Annual National Workshop with International Participation, NANO’2003 (Sofia, Bulgaria). *Optical characterization of self-assembled metallic films*. Tzvetan Velinov, Stoyan Russev, Brian Prevo, Orlin Velev

Conference Posters

- 78th ACS Colloid and Surface Science Symposium (June 2004, Yale University). *Controlled modification of the optical and adhesive properties of colloidal gold nanofilms*. Brian G. Prevo, Joseph Fuller, Tsvetan Velinov, Stoyan Russev, and Orlin D. Velev
- 77th ACS Colloid and Surface Science Symposium (June 2003, Atlanta, GA). *Fast Deposition of Structured Coatings from Microsphere and Nanoparticle Suspensions*. Brian Prevo, Ruben Carbonell, Orlin Velev
- Gordon Conference (June, 2003, New Hampshire). *Liquid-Liquid Microfluidics: electrostatic transport of freely suspended droplets*. Ketan H. Bhatt, Brian G. Prevo, Orlin D. Velev
- Annual Fall Meeting MRS (2003, Boston). *Fast Deposition of Structured Coatings from Microspheres and Nanoparticles*. Brian G. Prevo, Ruben G. Carbonell, Orlin D. Velev

Publicity generated from research projects

- Coverage of research in the national and international mass media

Science News, vol. 167, p. 78, “Congealing useful oddballs”, Jan., 2005.

PhysOrg.com: “Researchers Construct Tiny, Floating ‘Eyeballs,’ ‘Billiard Balls’ on Microchip”, Jan., 2005.

Live Science: Image of the Day, “Microscopic Eyes Are Shining”, Jan. 2005.

Science Daily, “Researchers Construct Tiny, Floating ‘Eyeballs,’ ‘Billiard Balls’ on Microchip”, Jan., 2005.

Science Blog: “Researchers Construct Tiny, Floating ‘Eyeballs,’ ‘Billiard Balls’ on Microchip”, Jan., 2005.

Chemical Online: “Researchers Construct Tiny, Floating ‘Eyeballs,’ ‘Billiard Balls’ on Microchip”, Jan., 2005.

AZoNano.com: “Researchers Construct Tiny, Floating ‘Eyeballs,’ ‘Billiard Balls’ on Microchip”, Jan., 2005.

NCSU press release on Nature Materials paper: “Engineers Create Tiny, Floating Particles on Microchip”, Jan., 2005.

NCSU Achieve Journal, “Biomedical Research Tools: Microscopic Factory to Yield Lab Safety and Savings”, Aug., 2004.

Analytical Chemistry, an ACS journal, highlights the *Nature* droplets microfluidics paper, Feb., 2004.

Science Daily, “Researchers Manipulate Tiny Floating Droplets on A Chip”, news on the droplet microfluidics work, Dec., 2003.

Nanobiotech News, a national weekly newspaper, “Researchers Create Virtual Multiwell Plate that Could Analyze Live Cells and Molecules”, Dec., 2003.

Technology Research News and Technology Review (MIT), “Chip Uses Oil to Move Droplets”, Dec., 2003.

Newswise, “Researchers Manipulate Tiny, Floating Droplets on a Chip”, Dec., 2003.

Small Times, a weekly nanotechnology report, ““Researchers Devise Slick Lab-on-aChip”, Dec., 2003.

Science Blog: “Researchers Manipulate tiny, floating droplets on a chip”, December 2003.

Innovations Report, a German technology alert highlights the *Nature* droplet microfluidics paper, Dec., 2003.

Sensor Technology Alert, published by the Technical Insights division of Frost & Sullivan highlights the *Nature* droplet microfluidics paper, Dec., 2003.

NCSU press release on *Nature* droplet microfluidics paper, December 2003.

References

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