

Sean D. Burns

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Objective

A full-time position for a PhD Chemical Engineer

Education

University of Texas at Austin, Chemical Engineering Graduate Department
Advisor: Dr. C. Grant Willson; Expect Ph.D. in **May 2003**; **GPA: 3.72/4.0**

Projects: The Willson research group has ongoing projects to understand the fundamental mechanism of both the dissolution and post exposure bake (PEB) steps of the microlithographic process. This project has focused on continued efforts on the critical ionization dissolution model which has been developed into a FORTRAN based algorithm by the Willson research group, and testing several theories for surface inhibition (a nonlinear dissolution phenomenon common to nonchemically amplified resists). The work has also involved quantifying free volume generation during the PEB of chemically amplified resists, with the goal of understanding acid transport, and recent work includes understanding the effects of humidity on post exposure bake processing.

University of Texas at Austin, Chemical Engineering Graduate Department
Masters of Science, Chemical Engineering, Summer 2002

Georgia Institute of Technology, Atlanta, GA
Bachelor of Chemical Engineering GPA: 3.81/4.0
Graduated with Highest Honor, June 1998

Related Work Experience

6/01-9/01 *Intern in Advanced Lithography Group, IBM T. J. Watson Research Center, Yorktown, NY*

- Collaborated with NIST (Gaithersburg, MD) to study acid transport in ultrathin films by neutron reflectivity and scattering angle neutron spectroscopy
- Responsible for synthesis of deuterated model photoresist polymer, wafer processing, experimental design and analysis
- Studied the effect of humidity on the post exposure processing of chemically amplified photoresists. Determined that humidity effects are important for tBOC and KRS-XE photoresists.

01/00-present *Undergraduate Supervisor*

Led multiple undergraduate research projects involving development rate measurements for fundamental understanding of photoresist dissolution, and thin film glass transition measurements by dynamic spectroscopic ellipsometry.

8/99-12/99 *Teaching Assistant, University of Texas at Austin*

Fundamental Measurements Laboratory – led students in laboratory experiments and was responsible for student evaluation

8/98-12/98 *Teaching Assistant, University of Texas at Austin*

Kinetics and Reactor Design – taught recitation section and assisted in writing exams.
Responsible for evaluation of students' homework and exams.

12/97-8/98 *Undergraduate Research Assistant, Institute of Paper Science and Technology, Atlanta GA*

Designed and built a reactor/furnace/collection system for testing catalysts and model compounds for an alternate paper production process.

Skills FORTRAN programming, multiwavelength interferometry, spectroscopic ellipsometry, radio-labeling techniques, atomic force microscopy, FTIR, neutron reflectivity, multiple polymer characterization techniques

Related Courses

- Chemical Processes for Microelectronics
- Surface Phenomena
- Polymer Science
- Graduate Mass Transfer
- Statistical Polymer Thermodynamics
- J.A. Woollam VASE Ellipsometry course
- FORTRAN programming
- Neutron Reflectivity and Small Angle Neutron Scattering (NIST short course)
- Semiconductor Microlithography
- Solid State Electronic Devices
- Design and Analysis of Experiments
- Advanced Characterization of Materials
- Basic Radiological Health and Safety
- Prolith (short course)

Awards and Activities

1998-2002	Harry P. Whitworth Endowed Graduate Fellowship in Engineering
1996-1998	Omega Chi Epsilon Honor Society
2000	Chair of UT ChE Graduate Recruiting
1998-2002	Graduate Student Executive Council (GSEC)
2002	Rom Rhone Fellowship for Professional Development in Materials Science
1997-2002	Volunteer work with GSEC, Georgia Tech Alumni Club
1994-2002	Intramural Softball, Basketball, Football, Volleyball

Publications

Sean D. Burns, Gerard M. Schmid, Lewis W. Flanagan, Pavlos Tsiartas, and C. Grant Willson, "Advancements to the Critical Ionization Dissolution Model" *J. Vac. Sci. & Tech. B*, 20(2), 527, (2002)

Sean D. Burns, Allen B. Gardner, Jodie Lutkenhaus, Val J. Krukonis, Paula M. Wetmore, Gerard M. Schmid and C. Grant Willson. "Understanding Non-linear Dissolution Rates in Photoresists", *Proc SPIE*, 4345, 37, (2001)

Allen B. Gardiner, Sean D. Burns, Anwei Qin, and C. Grant Willson. "Determination of Residual Casting Solvent Concentration Gradient in Resist Films by a 'Halt Development' Technique". *Journal of Vacuum Science and Technology B*. 19(1), 136, (2001)

Eric K. Lin, Chris L. Soles, Dario L. Goldfarb, Brian C. Trinque, Sean D. Burns, Ron L. Jones, Joseph L. Lenhart, Marie Angelopoulos, C. Grant Willson, Sushil K. Satija, Wen-li Wu. "Direct Measurement of the Reaction Front in Chemically Amplified Photoresists with Nanometer Resolution" *Science*, 297, July 19th, 2002, 372-275

Sean D. Burns, Michael D. Stewart, James Hilfiker, Ron Synowicki, Gerard M. Schmid, and C. Grant Willson. "Determining Free Volume Changes During PAB and PEB of a Chemically Amplified Resist" *Proc. 12th Intern'l Conf. on Photopolymers*, SPE, 323 (2001)

Sean D. Burns, Allen B. Gardiner, Val J. Krukonis, Paula M. Wetmore and C. Grant Willson.
"The Measurement of Concentration Gradients in Resist Films by a 'Halt Development' Technique" *ACS Polymeric Materials Science and Engineering*, Vol 81., 81, (1999)

Gerard M. Schmid, Sean D. Burns, Pavlos Tsiartas, C. Grant Willson, "Electrostatic effects during the dissolution of positive tone photoresists" *J. Vac. Sci. & Tech. B*, accepted for publication September, 2002

Sean D. Burns, David R. Medeiros, Heather F. Johnson, Greg A. Wallraff, William D. Hinsberg, and C. Grant Willson, "The Effect of Humidity on the Deprotection Kinetics of Chemically Amplified Resists" *Proc. SPIE*, 2002, (submitted February 2002)

Gerard.M. Schmid, Sean D. Burns, Michael D. Stewart, C.Grant Willson, "Mesoscale Simulation of the Lithographic Process" *Proc. SPIE*, 2002, (submitted February 2002)

Eric K.Lin, Chris L. Soles, Dario L. Goldfarb, Brian C.Trinque, Sean D.Burns, Ron L.Jones, Joseph L. Lenhart, Wen-li Wu, Marie Angelopoulos, C.Grant Willson, "Measurement of the Spatial Extent of Deprotection Reaction Front Using Neutron Reflectivity", *Proc. SPIE* 2002 (submitted February 2002)

Sean Burns, James Willson, Gerard Schmid, Brian Trinque, Pavlos Tsiartas, C. Grant Willson, "A Fundamental Study of Photoresist Dissolution with Real Time Spectroscopic Ellipsometry and Interferometry" to be presented at Proc. SPIE, February, 2003 (work in progress)

Dario L. Goldfarb, Eric K. Lin, Christopher L. Soles, Brian C. Trinque, Sean D. Burns, Ronald L. Jones, Joseph L. Lenhart, Marie Angelopoulos, C. Grant Willson, Sushil K. Satija, Wen-li Wu, "Chemically Amplified Photoresists: Fundamental Properties and Limits of Applicability to Sub-100nm Lithography", *Microlithography World*, February 2003 (work in progress)

Daniel Hall, Brian Osborne, Kyle Patterson, Sean. D. Burns, and C. Grant Willson, "Dissolution Behavior of Fluoroalcohol Substituted Polystyrenes", *Proc. SPIE*, **4345**, 1066-1072 (2001)

References

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