

## Curriculum Vitae

### JAMES E. HANSON

Date of birth: March 25, 1962

Office address: Department of Chemistry  
Seton Hall University  
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#### Education

1984 B.S. Chemistry and Geology, departmental honors, Summa Cum Laude  
Texas Christian University, Fort Worth, TX.

1990 Ph.D. Chemistry  
California Institute of Technology, Pasadena, CA.  
Dissertation Title: I. Matrix Isolation of 1,1-Diazenes  
II. Distance, Temperature, and Dynamic Solvent Effects on  
Electron Transfer Reactions  
Dissertation Advisor: Dr. Peter B. Dervan

#### Research and Teaching Experience

2002- Professor of Chemistry  
Seton Hall University, South Orange, NJ.  
Research: Organic and polymer chemistry and photochemistry; photoacid and photobase generators; synthesis, solution structure, and applications of dendritic polymers; materials for microlithography; molecular imprinting, nanomaterials  
Teaching: General Chemistry, Organic Chemistry, Polymer Chemistry, Advanced Organic Chemistry.

1997- 2002 Associate Professor of Chemistry  
Seton Hall University, South Orange, NJ.

1991-1997 Assistant Professor of Chemistry  
Seton Hall University, South Orange, NJ.

1989-1991 Postdoctoral Member of Technical Staff  
AT&T Bell Laboratories, Murray Hill, NJ.  
Synthesis and evaluation of specialty polymers for deep UV and X-ray microlithography; development of new photoacid generating compounds

#### Honors and Awards

1998 Seton Hall Research Excellence Award

1985-1988 National Science Foundation Predoctoral Fellow, California Institute of Technology, Pasadena, CA.

1983 Phi Beta Kappa, Texas Christian University, Fort Worth, TX.

1980-1984 Chancellor's Scholarship, Texas Christian University, Fort Worth, TX.

## Publications

1. "Synthesis and Characterization of Poly(4-*t*-Butoxycarbonyloxystyrene-sulfone)"  
R.S. Kanga, J.M. Kometani, E. Reichmanis, J.E. Hanson, O. Nalamasu, L.F. Thompson, S.A. Heffner, W.W. Tai, P. Trevor, *Chemistry of Materials*, **1991**, 3, 660-667.
2. "Single Component Chemically Amplified Resist Materials for Electron-beam and X-ray Lithography"  
A.E. Novembre, W.W. Tai, J.M. Kometani, J.E. Hanson, O. Nalamasu, G.N. Taylor, E. Reichmanis, and L.F. Thompson, *SPIE: Advances in Resist Technology and Processing VIII*, **1991**, 1466, 89-99
3. "PTBSS: A High Resolution Single Component Aqueous Base Soluble Chemically Amplified Resist"  
A.E. Novembre, W.W. Tai, J.M. Kometani, J.E. Hanson, O. Nalamasu, G.N. Taylor, E. Reichmanis, L.F. Thompson *Journal of Vacuum Science and Technology B* **1991**, 9, 3338-3342.
4. "Radiation-Induced Chemistry of Poly(4-[(*tert*-butoxycarbonyl)oxy]styrene-(*co*-sulfur dioxide))"  
A.E. Novembre, W.W. Tai, J.M. Kometani, J.E. Hanson, O. Nalamasu, G.N. Taylor, E. Reichmanis, L.F. Thompson *Chemistry of Materials* , **1992**, 4, 278-284.
5. "Lithographic Properties of Single- and Multi-component Chemically Amplified Resists Based on Copolymers of 4-*t*-Butoxycarbonyloxystyrene (TBS) and Sulfur Dioxide (SO<sub>2</sub>)"  
A.E. Novembre, J.E. Hanson, J.M. Kometani, W.W. Tai, O. Nalamasu, G.N. Taylor, E. Reichmanis, L.F. Thompson, D. Tomes *Microcircuit Engineering* **1992**, 17, 257-262.
6. "Synthesis and Evaluation of Copolymers of 4-*t*-Butoxycarbonyloxystyrene and 2-Nitrobenzylstyrene Sulfonates: Single Component Chemically Amplified Deep UV Imaging Materials"  
J.E. Hanson, E. Reichmanis, F.M. Houlihan, T.X. Neenan *Chemistry of Materials* , **1992**, 4, 837-842.
7. "Arylmethyl Sulfones: A New Class of Photoacid Generators"  
A.E. Novembre, J.E. Hanson, J.M. Kometani, W.W. Tai, E. Reichmanis, L.F. Thompson, R.J. West *Polymer Engineering and Science* , **1992**, 32, 1476-1480.
8. "Effect of Post-Exposure Delay in Positive Acting Chemically Amplified Resists: An Analytical Study"  
O. Nalamasu, E. Reichmanis, J.E. Hanson, R.S. Kanga, L.A. Heimbrook, A.B. Emerson, F.A. Baiocchi, and S. Vaidya. *Polymer Engineering and Science* , **1992**, 32, 1565-1570.
9. "X-ray and Deep UV Radiation Response of t-BOC Protected 4-Hydroxystyrene-Sulfone Copolymers"  
A.E. Novembre, J.E. Hanson, J.M. Kometani, W.W. Tai, E. Reichmanis in "Irradiation of Polymeric Materials" ACS Symposium Series #527, Reichmanis, O'Donnell, and Frank, editors, Washington DC, 1992.
10. "Sensitivity Enhancement of t-BOC Based Chemically Amplified Resists Through Optimization of Process Prebake Conditions"  
A.E. Novembre, J.M. Kometani, W.W. Tai, E. Reichmanis, L.F. Thompson, J.E. Hanson *Journal of Photopolymer Science and Technology* **1992**, 5, 9-15.

11. "t-BOC Based Resists: A Polymeric Platform for 0.25  $\mu\text{m}$  Lithographic Technologies"  
O. Nalamasu, A.E. Novembre, J.M. Kometani, J.E. Hanson *Journal of Photopolymer Science and Technology* **1993**, 6, 457-472.
12. "The 1.4 and 248 nm Radiation Response of Chemically Amplified Resists Containing Arylmethyl Sulfone Photoacid Generators"  
J.E. Hanson, D.A. Pingor, A.E. Novembre, J.M. Kometani, W.W. Tai *Polymers for Advanced Technology* **1994**, 5, 49-55.
13. "Weak Temperature Dependence of Electron Transfer Rates in Fixed-Distance Porphyrin-Quinone Model Systems"  
L.R. Khundkar, J.W. Perry, J.E. Hanson, P.B. Dervan. *Journal of the American Chemical Society* **1994**, 116, 9700-9709.
14. "Photoacid and Photobase Generators: Arylmethyl Sulfones and Ammonium Salts"  
J.E. Hanson, K.H. Jensen, N. Gargiulo, D. Motta, D.A. Pingor, A.E. Novembre, D.A. Mixon, J.M. Kometani, C. Knurek *Polymeric Materials: Science and Engineering*, **1995**, 72, 201-202.
15. "Photoacid and Photobase Generators: Arylmethyl Sulfones and Benzhydrylammonium Salts"  
J.E. Hanson, K.H. Jensen, N. Gargiulo, D. Motta, D.A. Pingor, A.E. Novembre, D.A. Mixon, J.M. Kometani, C. Knurek in ACS Symposium Series No. 614, *Microelectronics Technology: Polymers for Advanced Imaging and Packaging*, E. Reichmanis, C.K. Ober, S.A. MacDonald, T. Iwayanagi, and T. Nishikubo eds. American Chemical Society: Washington DC, 1995, 137-148.
16. "New Approaches to the Synthesis of Poly(aryl ether) Dendrimers"  
T.L. Tyler, J.E. Hanson *Polymeric Materials: Science and Engineering*, **1995**, 73, 356-357.
17. "Chromophore Labelled Dendrimers: Photophysical Probes of Dendrimer Structure and Dynamics"  
J.E. Hanson, W.R. Murphy Jr., J.M. Riley, T.L. Tyler, S.O. Kelley, A.M. Makarewicz, *Polymeric Materials: Science and Engineering*, **1995**, 73, 358-359.
18. "Imaging and Materials Processing with Photogenerated Bases"  
J.E. Hanson, K.H. Jensen *Imaging Science and Technology*, **1996**, 49, 508-511.
19. "Photophysical Studies of Pyrene Focused Poly(aryl ether) Monodendrons: Quenching and Excimer Formation"  
J.E. Hanson, W.A. Khan, W. R. Murphy, Jr. *Polymeric Materials: Science and Engineering*, **1999**, 80, 68-69.
20. "An Efficient Synthesis of Poly(aryl ether) Monodendrons and Dendrimers Based on 3,5-Bis(Hydroxymethyl)phenol"  
T.L. Tyler, J.E. Hanson *Chemistry of Materials*, **1999**, 11, 3452-2459.
21. "Dendrimers as Stationary Phases in Capillary Electrochromatography"  
H.Chao, J.E. Hanson. *Polymeric Materials Science and Engineering*, **2000**, 83, 438-439.
22. "Carbamates as Novel Dissolution Inhibitors in Photoresists"  
T. Watt, J.E. Hanson, W.R. Murphy, Jr. *Partners in Science: Chemical Communication*, **2000**, 48-50.

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23. "Pyrene Labeled Poly(aryl ether) Monodendrons: Synthesis, Characterization, Diffusion Coefficients, and Photophysical Studies"  
J.M. Riley, S. Alkan, A. Chen, M. Shapiro, W.A. Khan, W.R. Murphy, Jr., J.E. Hanson *Macromolecules*, **2001**, *34*, 1797-1809.
24. "Using NPS Chromatography to Monitor Mesylation Reactions"  
C.J. Shaw, H. Chao, J.E. Hanson *J. Liq. Chrom. & Rel. Technol.* **2001**, *24*, 869-880.
25. "Synthesis and Photochemistry of Tertiary Amine Photobase Generators"  
K.H. Jensen, J.E. Hanson *Chemistry of Materials*, **2002**, *14*, 918-923.
26. "Dendritic Polymers as Bonded Stationary Phases in Capillary Electrochromatography"  
H.C. Chao, J.E. Hanson *Journal of Separation Science*, **2002**, *25*, 345-350.
27. "Synthesis and Characterization of Novel Unsymmetrical Hyperbranched Poly(phenylene sulfides)"  
Mellace, A.; Hanson, J.E. *Polymer Preprints*, **2003**, *44*(2), 845-846.
28. "Synthesis of Cyclopropane Dendrimers"  
Han, H.J.; Hanson, J.E. *Polymer Preprints*, **2003**, *44*(2), 798-799.
29. "Polymerization of 4-Chloro-1,3-Benzenedithiol"  
Miklius, E.; Griepenburg, J.; Hanson, J.E. *Polymer Preprints* **2003**, *44*(2), 797.
30. "Cross-linking of Polyethyleneimine with Isophthalaldehyde: A Model for Soluble Imprinted Polymers"  
Li, S.; Hanson, J.E. *Polymeric Materials Science and Engineering* **2003**, *89*, 559.
31. "Hyperbranched Poly(phenylene sulfide) and Poly(phenylene sulfone)"  
Mellace, A.; Hanson, J.E.; Griepenburg, J. *Chemistry of Materials* **2005**, *17*, 1812-1817.
32. "Direct Synthesis of Poly(arylmethylsulfone) Monodendrons"  
Zhao, Q.; Hanson, J.E.; *Synthesis* **2006**, 397-399.
33. "Fluorescence Excitation Spectroscopy of Polystyrene Near the Critical Concentration  $c^*$ "  
Healy, M.S.; Hanson, J.E.; *Journal of Applied Polymer Science* **2007**, *104*, 360-364.
34. Book Review: *Polymers and Light: Fundamentals and Technical Applications* By Wolfram Schnabel (Hahn-Meitner-Institut, Berlin, Germany). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2007.  
Hanson, J.E.; *Journal of the American Chemical Society* **2007**, *129*, 14526-14527.

## Patents

1. U.S. Patent 5,374,504 "Resist Materials and Processes of Their Use"  
J.E. Hanson and A.E. Novembre (issued December 20, 1994)