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Kimberly A. Firestone

EDUCATION

University of Washington, Seattle, Washington
M.S. in Physical Chemistry, August 2002
Ph.D. Candidate in Physical Chemistry, degree expected June 2005
“Frequency-Agile Hyper-Rayleigh Scattering Studies of Charge-Transfer Chromophores”
Professor Larry Dalton, Research Advisor

Rice University, Houston, Texas
B.A. in Chemistry, ACS Certified, May 2000

The Pembroke Hill School, Kansas City, Missouri

RESEARCH EXPERIENCE

Research Assistant, University of Washington
Chemistry Department, August 2000-present. Advisor: Prof. Larry Dalton.
NSF Science and Technology Center: Materials and Devices for Information Technology Research.
Performed characterization and spectroscopic studies of organic electro-optical chromophores via hyper-Rayleigh scattering, employing three different laser systems (Ti:Sapphire oscillator/optical parametric oscillator; Ti:sapphire regenerative amplifier/optical parametric amplifier; Raman-shifted Nd:YAG). Calculated hyperpolarizabilities of chromophores from these results and explored their dispersion relationships through frequency-agile studies. Explored novel techniques for fluorescence discrimination in hyper-Rayleigh scattering. Pursued better understanding of solvent/chromophore interactions and hyperpolarizabilities of pure solvents. Developed preliminary designs for hybrid nonlinear optical/photonics bandgap devices. Assisted in organizing an NSF site visit leading to the funding of a Science and Technology Center. Recruited graduate students. Mentored graduate and undergraduate students in electro-optics research, scientific writing, and presentation skills.

National Science Foundation (REU) Intern, Rice University
Rice Quantum Institute, Summer 1999. Advisor: Prof. Vicki Colvin.
Developed techniques for analyzing the quality of photonic band gap colloidal silica crystals. Synthesized crystals and imaged samples via scanning electron microscopy. Extracted quantitative data through image processing to correlate faults in the crystals (e.g. grain boundaries, cracks, disordered patches of colloids) with colloidal monodispersity. Presented results at the Colloids and Surface Science Division's poster session at the American Chemical Society meeting in New Orleans. Continued work as an undergraduate researcher through May 2000.

Energy Research Undergraduate Laboratory Fellow, Oak Ridge National Laboratory
Environmental Sciences Division. Summer 1998. Advisor: Dr. Gerilynn Moline.
Served as research assistant to a geohydrologist, studying transport phenomena in fractured porous materials. Examined geochemical and geologic controls on such transport by excavating cores from the Oak Ridge Reservation subsurface, measuring high-resolution CT scans, and computer modeling. One of nineteen students chosen nationally to participate in two poster sessions at the Department of Energy offices in Washington, D.C.

National Science Foundation (REU) Intern, University of Missouri
Research Reactor — Radiopharmaceuticals Group. Summer 1997. Advisor: Prof. Gary Ehrhardt.
Research Reactor — Radiopharmaceuticals Group. Summer 1996. Advisor: Prof. Alan Ketring.
Explored the use of a tetrapeptide chelating moiety in radiolabeling polypeptides and monoclonal antibody fragments as radioimmunotherapy agents. Optimized techniques for efficient transfer of a radionuclide to the tetrapeptide via an exchange ligand. Examined the survival of rare-earth-containing Fullerenes, irradiated under a thermal neutron flux, for use as radiopharmaceutical agents. Performed preliminary investigations into the employment of radioactive stents to improve angioplasty. Attended a series of lectures on research methods and radiation safety.

**SCIENTIFIC
TEACHING
EXPERIENCE**

STC-MDITR Participant, University of Washington
NSF Science and Technology Center: Materials and Devices for Information Technology Research. Autumn 2002-present. Supervisor: Prof. Larry Dalton.
Instructed three undergraduate students in experimental research techniques ranging from UV-visible spectrophotometry to femtosecond laser spectroscopy. Developed summer REU projects for two undergraduates, supervised their daily work, and provided instruction for giving scientific presentations. Gave regular informal talks to four REU students on electro-optics and provided guidance in designing posters for the MDITR "Photonics Phest." Led an extensive effort to write introductory essays explaining topics in nonlinear optics to facilitate the learning of incoming graduate students in the Dalton Research Group.

Teaching Assistant, Organic Chemistry Laboratory, Rice University
Chemistry Department, September 1998-January 2000. Supervisor: Prof. Seiichi Matsuda.
Instructed groups of fifteen-eighteen students in laboratory techniques and safe procedures in the microscale organic teaching laboratory. Prepared reagents for experiments. Designed final project assignments. Corrected and graded laboratory notebooks. Assigned final grades.

National Science Foundation (REU) Peer Mentor, University of Missouri
Research Reactor. Summer 1997. Supervisor: Prof. Fred Ross.
Assisted other interns in creating scientific posters, writing papers, and preparing lectures on their summer projects. Served as a liaison between students and scientists to facilitate research progress.

**ADDITIONAL
TEACHING
EXPERIENCE**

Coordinator, Students Organized Against Rape (SOAR), Rice University
Health Education Office. January 1997-June 1999.
In conjunction with the Houston Area Women's Center, trained speakers, organized speaking engagements, and ran the weekly meetings of a student service organization. Gave 45+ presentations on teen dating violence and related issues at Houston area high schools and middle schools. Served as a guest lecturer at an international conference for violence prevention on university campuses. Acted as a university-wide resource on topics ranging from sexual harassment to gender discrimination.

January Interim Class Instructor, The Pembroke Hill School
January 1993-2001. Co-Instructor: Nancy Lacy.
Taught an annual week-long class in Ukrainian folk art in topics ranging from batik wax-relief techniques to ancient and modern design symbolism.

Assistant Dance Teacher, Kansas City Tap Company
January 1994-January 1996. Supervisor: Betty Tillotson.
Instructed two classes of elementary-school and kindergarten-aged students in ballet and tap.

Piano Instructor, Kansas City, MO
August 1994-June 1996. Mentor: Cynthia Siebert, Director, K.C. Friends of Chamber Music.
Gave weekly piano lessons to an adult student, and provided occasional instruction for elementary-school students.

PUBLICATIONS

Firestone, K. A.; Clot, O.; Dalton, L. R.; Reid, P. J. "Frequency-domain discrimination of two photon excited fluorescence in hyper-Rayleigh scattering. *Appl. Spectrosc.*, **2005**, in preparation.

Liao, Y.; Firestone, K. A.; Eichinger, B. E.; Bhattacharjee, S.; Robinson, B. H.; Reid, P. J.; Dalton, L. R. "Theory, synthesis, and optical properties of a macrocyclic trichromophore bundle with parallel-aligned dipole moments." **2005**, in preparation.

Casmier, D. M.; Firestone, K. A.; Eichinger, B. E.; Sullivan, P.; Lao, D.; Cady, F.; Reid, P. J.; Dalton, L. R. "Gradient-bridge chromophores: theory, synthesis, and non-linear optical measurements." **2005**, in preparation.

Firestone, K. A.; Clot, O.; Lao, D.; Reid, P. J.; Dalton, L. R. "Hyper-Rayleigh scattering studies of novel NLO chromophores with substituted 2,2'-Bi(3,4-propylenedioxythiophene) π -conjugated bridges." **2005**, in preparation.

Firestone, K. A.; Lao, D. B.; Casmier, D. M.; Clot, O.; Dalton, L. R.; Reid, P. J. "Frequency-agile hyper-Rayleigh scattering studies of electro-optic chromophores." *Proc. SPIE*, **2005**, in preparation.

Buker, N.; Firestone, K. A.; Haller, M.; Purvis, L.; Lao, D. B.; Snoeberger, R.; Jen, Alex K.-Y.; Reid, P. J.; Dalton, L. R. "Synthesis and characterization of functionalized guanidines for development of electro-optic materials with highly desirable properties." *J. Mater. Chem.*, **2005**, in preparation.

Liao, Y.; Bhattacharjee, S.; Firestone, K. A.; Eichinger, B. E.; Paranj, R.; Robinson, B. H.; Reid, P. J.; Dalton, L. R. "Supramolecule of antiparallel aligned neutral-ground-state chromophore and zwitterionic chromophore as a novel nonlinear optical material." *Angew. Chem.* **2005**, submitted.

Clot, O.; Haller, M.; Liao, Y.; Firestone, K. A.; Purvis, L.; Carlson, B.; Phelan, G. D.; Dalton, L. R.; Jen, A. K.-Y.; Robinson, B. H.; Reid, P. J. "Waist-thick push-pull NLO chromophores based on substituted 2,2'-Bi(3,4-propylenedioxythiophene) π -conjugated bridges." *Chem. Mater.* **2005**, submitted.

Buker, N.; Firestone, K. A.; Haller, M.; Purvis, L.; Snoeberger, R.; Lao, D.; Jen, A. K.-Y.; Dalton, L. R. "Synthesis and characterization of functionalized guanidines for development of electro-optic materials with highly desirable properties." *Mat. Res. Soc. Proc.* **2005**, 846, accepted.

Liao, Y.; Eichinger, B. E.; Firestone, K. A.; Haller, M.; Luo, J.; Kaminsky, W.; Benedict, J. B.; Reid, P. J.; Jen, A. K.-Y.; Dalton, L. R.; Robinson, B. H. "Systematic study of the structure-property relationship of a series of ferrocenyl nonlinear optical chromophores." *J. Am. Chem. Soc.*, **2005**, 127, 2758-2766.

Dalton, L. R.; Robinson, B. H.; Jen, A. K.-Y.; Reid, P.; Eichinger, B.; Jang, S.-H.; Luo, J.; Liu, S.; Liao, Y.; Firestone, K. A.; Bhatambrekar, N. P.; Bale, D.; Haller, M. A.; Bhattacharjee, S.; Schendel, J.; Sullivan, P. A.; Hammond, S.; Buker, N.; Cady, F.; Chen, A.; Steier, W. H. "Organic electro-optic materials." *Proc. SPIE*, **2004**, 5621, 93-104.

Firestone, K. A.; Reid, P.; Lawson, R.; Jang, S.-H.; Dalton, L. R. "Advances in organic electro-optic materials and processing." In honor of Tobin Marks. *Inorg. Chim. Acta.* **2004**, 357, 3957-3966.

Liao, Y.; Firestone, K. A.; Robinson, B. H.; Reid, P. J.; Dalton, L. R. "Synthesis and optical properties of a macrocyclic trichromophore bundle with parallel-aligned dipole moments." *Polymer Preprints*, **2004**, 45(2), 642-643.

Sullivan, P. A.; Bhattacharjee, S.; Eichinger, B.; Firestone, K.; Robinson, B.; Dalton, L. R. "Exploration of a series type multifunctionalized nonlinear optical chromophore concept." *Proc. SPIE*, **2004**, 5351, 253-259.

Casmier, D. M.; Sullivan, P. A.; Clot, O.; Firestone, K.; Eichinger, B.; Lee, S.; Heller, S.; Brumbaugh, A.; Millard, B.; Dalton, L. R. "New paradigm in NLO chromophore design through a gradient bridge concept." *Proc. SPIE*, **2004**, 5351, 243-252.

Firestone, K. A.; Bale, D. H.; Westphal, James, B.; Scott, D. C.; Reid, P. J.; Dalton, L. R. "Frequency agile hyper-Rayleigh scattering studies of non-linear optical chromophores." *Polymeric Materials: Science and Engineering*, **2003**, 88, 294-295.

CONFERENCE PRESENTATIONS

Firestone, K. A., Liao, Y.; Robinson, B. H.; Dalton, L. R.; Reid, P. J. "Hyper-Rayleigh scattering studies of novel nonlinear optical chromophores." 52nd Annual Western Spectroscopy Association Conference, Pacific Grove, CA, January 26-28, **2005**. (Contributed Poster)

Buker, N., Firestone, K. A.; Haller, M.; Purvis, L.; Snoeberger, R.; Lao, D.; Jen, A. K.-Y.; Dalton, L. R. "Synthesis and characterization of functionalized guanidines for development of electro-optic materials with highly desirable properties." Materials Research Society, Fall Meeting, Boston, MA, November 29-December 3, **2004**, DD 6.1. (Contributed Talk)

Liao, Y.; Firestone, K. A.; Robinson, B. H.; Reid, P. J.; Dalton, L. R. "Synthesis and optical properties of a macrocyclic trichromophore bundle with parallel-aligned dipole moments." *Abstracts of Papers, 228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004*, POLY-069. (Contributed Poster)

Firestone, K. A.; Bale, D. H.; Westphal, James, B.; Scott, D. C.; Reid, P. J.; Dalton, L. R. "Frequency agile hyper-Rayleigh scattering studies of non-linear optical chromophores." *Abstracts of Papers, 225th ACS National Meeting, New Orleans, LA, March 23-27, 2003*, PMSE-179. (Contributed Poster)

Colvin, V. L.; Jiang, P.; Kacher, J.; Turner, M. E.; Kulinowski, K.; Firestone, K. "Colloidal monolayers and multilayers as templates for nanostructure control." *Book of Abstracts, 219th ACS National Meeting, San Francisco, CA, March 26-30, 2000*, PHYS-177. (Contributed Talk)

Firestone, K. A.; Jiang, P.; Colvin, V. L. "Planar Colloidal Crystals: Colloidal monodispersity and crystalline quality." *Book of Abstracts, 218th ACS National Meeting, New Orleans, August 22-26, 1999*, COLL-096. (Contributed Poster)

Briskman, A. J.; Jiang, P.; Firestone, K.; Colvin, V. L. "Macroporous Conducting Polymers." *Book of Abstracts, 218th ACS National Meeting, New Orleans, August 22-26, 1999*, CHED-161. (Contributed Poster)

Koch, E.; Toran, L.; Moline, G.; Firestone, K. "Modeling effective fractures in a well-characterized intact core." *Eos, Transactions, American Geophysical Union, 1999, 80 (17)*, H22C-05.

PROFESSIONAL DEVELOPMENT

STC-MDITR Annual Scientific Retreat & Industrial Affiliate Program Expo
Participant & Speaker Georgia Institute of Technology, February 2005

ACS-PRF Workshop: "The Chemistry of Information Technology"
Attendee & Volunteer STC-MDITR, University of Washington, June 2003

AFFILIATIONS

American Chemical Society
Division of Polymeric Materials: Science and Engineering
Division of Physical Chemistry
SPIE – The International Society for Optical Engineering

HONORS AND ACTIVITIES

SPIE Scholarship (2004)
Chemistry Department Colloquium Committee, University of Washington (2001-2004)
Dow Chemical Company Outstanding Graduate Student Award, University of Washington (2000)
National Merit Scholar (1996-2000)
President's Honor Roll, Rice University (1999)
Vice President's Appreciation Award, Rice University (1998)
Choreographer, Rice University College Musicals: *Cabaret* (1999) & *Godspell* (1998)
Advanced Placement National Scholar (1996)
Ten-time National Science Olympiad Medalist (1994, 1995, 1996)
Third-Place Team, National Science Olympiad (1996)
Fourth-Place Team, Department of Energy National Science Bowl (1996)
Cum Laude Society, The Pembroke Hill School (1995)
Sell artwork on commission (1993-present)