

Todd D. Krauss

Assistant Professor
Department of Chemistry
University of Rochester
Rochester, NY 14627
Phone: 716-275-5093 FAX: 716-473-6889
email: krauss@chem.rochester.edu

Education

Ph.D. in Applied Physics, Cornell University, Ithaca, New York (1998)
Thesis Title: *Vibrational Properties and Exciton-Phonon Interactions in PbS Nanocrystallites*
Committee Chair: Professor Frank W. Wise, Ph.D.

M.S. in Applied Physics, Cornell University, Ithaca, New York (1994)
Committee Chair: Professor Frank W. Wise, Ph.D.

B.S. with distinction in Applied and Engineering Physics,
Cornell University, College of Engineering, Ithaca, New York (1991)

Work Experience

Assistant Professor of Chemistry, University of Rochester, Rochester, NY (2000-Present)

Postdoctoral Research Fellow, Columbia University, New York, NY (1997-2000)

Post-doctoral Advisor: Professor Louis E. Brus, Ph.D.

Determination of the charge, polarizability, and photoionization properties of CdSe nanocrystals both individually and in self-assembled monolayers using electrostatic force microscopy (EFM). Investigated concurrent EFM and single CdSe nanocrystal luminescence spectroscopy experiments. Modified atomic force microscope tips with carbon nanotubes.

Graduate Research Assistant, Cornell University, Ithaca, NY (1991-1997)

Advisor: Professor Frank W. Wise, Ph.D

Thesis concerned the study of the vibrational modes of PbS nanocrystals and the coupling of these modes to electronic states. Research involved ultrafast four-wave mixing spectroscopic studies of PbS nanocrystals using a variety of home-built excitation sources including modelocked Ti:sapphire, Cr:forsterite, and dye lasers, optical parametric amplifiers, and a

Ti:sapphire regenerative amplifier. Theoretical modeling of the aforementioned four-wave mixing experiments. Spontaneous Raman scattering measurements of PbS nanocrystals. Theoretical studies of the quantum confined vibrational modes of a PbS nanocrystal. Wet chemical synthesis of PbS nanocrystals.

Undergraduate Research Assistant, Cornell University, Ithaca, NY (1991)

Advisor: Professor John Silcox, Ph. D.

Investigated the quality of the interface between bonded InP and GaAs semiconductor wafers. Research centered on preparation of samples for study by Scanning Transmission Electron Microscopy. Experience included use of dimpler machine, ion mill, and preparing STEM samples in cross section.

Teaching Experience

Lecturer:

University of Rochester, Chemistry 451, Quantum Chemistry

Course Development:

Development of nanomaterials scanning probe microscopy experiment for Chemistry 232, Molecular Spectroscopy Laboratory, University of Rochester

Development of nanomaterials synthesis experiment for Chemistry 234, Advanced Laboratory Techniques, University of Rochester

Additional Experience

Maintenance Control Officer, Rockaway, NY (1998-1999)

Employer: United States Army Reserve

Responsible for the overall maintenance productivity and performance of a maintenance unit comprised of over 130 soldiers. Duties include management and allocation of maintenance personnel and resources, and teaching of individual and collective maintenance tasks to soldiers of all skill levels.

Platoon Leader/Detachment Commander, Horseheads, NY and Webster, NY (1992- 1997)

Employer: United States Army Reserve

Responsible for the overall performance of a maintenance unit comprised of more than 50 soldiers. Duties include personnel management, and planning, execution and evaluation of various training activities.

Awards and Honors

New Focus Research Award (1995-1997)
Armed Forces Communications and Electronics Fellowship (1995)
Department of Education Fellowship (1992-1995)
Xerox Fellowship (1992-1993)
Army ROTC Armed Forces Communications and Electronics Award (1991)
Army ROTC Highest Cumulative GPA Award (1991)
Cornell Tradition Fellow (1987-1988)
Tau Beta Pi Honor Society (1988-1991)

Professional Activities

Professional Organizations:

Member, American Physical Society
Member, American Chemical Society
Member, Optical Society of America
Member, Materials Research Society
Member, American Association for the Advancement of Science

Reviewer of manuscripts for the following publications:

Journal of the American Chemical Society
Journal of the Optical Society of America B
Optics Letters
Applied Physics Letters
Materials Science and Engineering B
Chemical Physics Letters

Program Committees:

Served on the program committee for the Frontiers in Teaching and Research in Chemistry workshop, University of Rochester (2000).

Publications**Todd D. Krauss**

T. D. Krauss and F. W. Wise, "Femtosecond measurement of nonlinear absorption and refraction in CdS, ZnSe, and ZnS," *Appl. Phys. Lett.* **65**, 1739 (1994).

T. D. Krauss, J. K. Ranka, F. W. Wise, and A. L. Gaeta, "Measurements of the tensor properties of third-order nonlinearities in wide-gap semiconductors," *Opt. Lett.* **20**, 1110 (1995).

I. Kang, T. D. Krauss, F. W. Wise, B. G. Aitken, and N. F. Borelli, "Femtosecond measurement of enhanced optical nonlinearities in sulfide glasses and heavy-metal doped oxide glasses," *J. Opt. Soc. Am. B* **12**, 2053 (1995).

T. D. Krauss, F. W. Wise, and D. B. Tanner, "Observation of coupled vibrational modes of a semiconductor nanocrystal," *Phys. Rev. Lett.* **76**, 1376 (1996).

K.C. Bretz, Y. C. Lee, T. D. Krauss, F. W. Wise, and W. H. Sachse, "Picosecond acoustics for the characterization of submicron polymeric films," *Ultrasonics* **34**, 513 (1996).

I. Kang, S. Smolorz, T. Krauss, F. Wise, B. G. Aitken and N. F. Borelli, "Time-domain observation of nuclear contributions to the optical nonlinearities of glasses," *Phys. Rev. B* **54**, 12641 (1996).

T. D. Krauss and F. W. Wise, "Raman-scattering study of exciton-phonon coupling in PbS nanocrystals," *Phys. Rev. B* **55**, 9860 (1997).

I. Kang, T. Krauss and F. Wise, "Sensitive measurement of nonlinear refraction and two-photon absorption by spectrally-resolved two-beam coupling," *Opt. Lett.* **22**, 1077 (1997).

A. Lipovskii, E. Kolobkova, V. Petrikov, I. Kang, A. Olkhovets, T. Krauss, M. Thomas, J. Silcox, F. Wise, Q. Shen, and S. Kycia, "Synthesis and characterization of PbSe quantum dots in phosphate glass," *Appl. Phys. Lett.* **71**, 3406 (1997).

T. D. Krauss and F. W. Wise, "Coherent acoustic phonons in a semiconductor quantum dot," *Phys. Rev. Lett.* **79**, 5102 (1997).

J. M. Fox, T. J. Katz, S. V. Elshocht, T. Verbiest, M. Kauranen, A. Persoons, T. Krauss, and L. Brus, "Synthesis, self-association, and nonlinear optical properties of conjugated helical metal phthalocyanines," *J. Am. Chem. Soc.* **121**, 3453 (1999).

T. D. Krauss and L. E. Brus, "Charge, Polarizability, and Photoionization of Single Semiconductor Nanocrystals," *Phys. Rev. Lett.* **83**, 4840 (1999).

T. D. Krauss and L. E. Brus, "Electronic properties of single semiconductor nanocrystals: optical and electrostatic force microscopy measurements," *Mat. Sci. Eng. B-Solid* **69-70**, 289 (2000).

J. Jiang, T. D. Krauss, and L. E. Brus, "Electrostatic Force Microscopy Characterization of Trioctylphosphine Oxide Self-Assembled Monolayers on Graphite," *J. Phys. Chem. B* **104**, 11936 (2000).

T. D. Krauss, S. O'Brien, and L. E. Brus, "Charge and Photoionization Properties of Single Semiconductor Nanocrystals," *J. Phys. Chem. B*, **105**, 1725 (2001).

T. D. Krauss and F. W. Wise, "Ultrafast optical measurements of exciton-phonon coupling in PbS nanocrystals," (submitted).

Patents Filed

B. L. Miller and T. D. Krauss, "Nanocrystal-based colorimetric sensors for human pathogens," submitted (2000).

Poster Presentations

J. Pero, T. D. Krauss, and B. L. Miller, "Development of Nanocrystal-based Colorimetric Sensors for Detection of Biological Contaminants," presented at the Gordon Research Conference on Chemical Sensors and Interfacial Design, Il Ciocco, Italy (2001).

Invited Technical Presentations

T. D. Krauss and L. E. Brus, "Charge, Polarizability, and Photoionization of Single Semiconductor Nanocrystals," presented at the Naval Research Laboratory, Washington D.C. (2000).

T. D. Krauss, "Charge and Photoionization Properties of Single Semiconductor Nanocrystals," presented at Saint Lawrence University, Canton, New York (2000).

T. D. Krauss, "Charge and Photoionization Properties of Single Semiconductor Nanocrystals," presented at the State University of New York at Potsdam, Potsdam, New York (2000).

T. D. Krauss, "Electrostatic Force Microscopy of Single CdSe Nanocrystals," presented at the American Physical Society March Meeting, Seattle, Washington (2001).

T. D. Krauss, "Electronic Properties of Single CdSe Nanocrystals," presented at the New York State Section of the American Physical Society Meeting, Yorktown Heights, New York (2001).

T. D. Krauss, "Charge, Photoionization, and Photoluminescent Properties of Individual Semiconductor Nanocrystals," presented at Kodak Research Laboratories, Rochester, New York (2001).

T. D. Krauss, "Quantum Dots: Bigger, Faster, Brighter, Smaller," presented at Evident Technologies Inc., Albany, New York (2001).

Technical Presentations

T. D. Krauss and F. W. Wise, "Resonance Raman spectroscopy and electron-phonon coupling in PbS quantum dots," presented at the Quantum Electronics and Lasers Science Conference, Baltimore, Maryland (1995).

T. D. Krauss, F. W. Wise, and D. B. Tanner, "Observation of coupled vibrational modes of a semiconductor nanocrystal," presented at the American Physical Society March Meeting, St. Louis, Missouri (1996).

T. D. Krauss and F. W. Wise, "Exciton-phonon coupling in PbS nanocrystals," presented at the American Physical Society March Meeting, Kansas City, Missouri (1997).

T. D. Krauss and F. W. Wise, "Observation of coherent acoustic phonons in a semiconductor nanocrystal: implications for electronic dephasing," presented at the conference on Radiative Processes and Dephasing in Semiconductors, Coeur d'Alene, Idaho (1998).

T. D. Krauss and L. E. Brus, "Electrostatic Properties of Single Semiconductor Nanocrystals," presented at the American Physical Society March Meeting, Atlanta, Georgia (1999).

T. D. Krauss, M. Nirmal, G. Ge, Z. Yu, M. G. Bawendi, J. K. Trautman, J. J. Macklin, T. D. Harris and L. E. Brus,” Luminescent and Dielectric Properties of Single Semiconductor Nanocrystals,” presented at the Materials Research Society Spring Meeting, San Francisco, California (1999).

T. D. Krauss and L. E. Brus, “Electrostatic Properties of Single Semiconductor Nanocrystals,” presented at the European Materials Research Society Spring Meeting, Strasbourg, France (1999).

T. D. Krauss and L. E. Brus, “Charge, Polarizability, and Photoionization of Single Semiconductor Nanocrystals,” presented at the American Physical Society March Meeting, Minneapolis, Minnesota (2000).