

Stephen K. Doorn (MPA-CINT, MS-K771, skdoorn@lanl.gov)

Education

B.S.-Chemistry with Honors, Phi Beta Kappa, University of Wisconsin, 1985
M.S. in Chemistry, Northwestern University, 1986
Ph.D. in Physical/Analytical Chemistry, Northwestern University, 1990

Current Position: CINT Nanophotonics and Optical Nanomaterials Science Partner Leader

Professional Experience

Technical Staff Member, LANL, Nov. 1992 to present. Responsibilities have included initiating and building an internationally recognized nanomaterials effort, leading a large inorganic analysis team as well as performing R&D on analytical applications of CE/Raman, spectroscopic characterization of defense related materials, and developing new Raman molecular imaging capability.

Leader Nanomaterials/Nanosensor Effort, LANL, 2000 to present. Head of 5-7 member team of staff, postdocs, and students. Developing programs in SERS-active particle development for tagging and multiplexed bioanalytical applications and in carbon nanotube fundamental spectroscopy and applications.

Carbon Nanotube Highlights: Pioneering single nanotube characterization, high-resolution geometry-based separations, selective reaction chemistry of carbon nanotubes, novel nanotube sensors development. First Raman studies of surfactant solubilized nanotubes. Discovery and description of structure dependence of exciton-phonon coupling. First spectroscopic characterization of technologically important single-tube intramolecular junctions. Demonstration of excitons in metallic carbon nanotubes.

SERS Highlights: Development of first SERS-active spectral tags suitable for flow cytometry applications. First demonstration of SERS-based detection for flow cytometry. Development of new core-shell SERS and MEF active nanoparticles for use in advanced flow manipulation and detection concepts.

Team Leader, Inorganic Analysis Team (CST-9), LANL, Nov. 1994 to July 1998. Responsibility for 15 staff and technicians and annual budget exceeding \$1 million. Implemented improvements in efficiency, quality control, instrumentation, and greatly increased customer satisfaction and confidence in team's product.

Post-Doctoral Research Fellow, INC-4, LANL, March 1990 to Nov. 1992. Application of time-resolved spectroscopies (from ps to long timescales) to the study of photochemistry and electron-transfer reactions in transition metal complexes. Raman of transition metal complexes.

Expertise

Laser spectroscopic characterization of chemical systems including Raman and time-resolved fluorescence, absorbance and IR from ps to long timescales. Nanoparticle and nanomaterials synthesis, characterization, manipulation, and applications. Development of chemical analysis and separations instrumentation including capillary electrophoresis and new CE detection methods, laser ablation, LIBS, photoacoustics, and ICP-emission.

Awards

DOE Office of Science Outstanding Mentor Award, 2008.
Nanotech Briefs Nano50 Award, 2005
Defense Programs Award of Excellence, 2001, 2003
LANL Distinguished Performance Award, 1998

Stephen K. Doorn (continued)

Selected Nanoscience Symposia Organized

Co-Organizer: Symposium on Carbon Nanotubes and Nanostructures: Fundamental Properties and Processes, Electrochemical Society Meeting, April 2010.

Co-Organizer: Symposium on Carbon Nanotubes and Related Materials, APS Mtg, Mar. 2007.

Selected Recent Invited Talks

“From SERS to Nanotubes: Raman Investigations at the Nanoscale”, MIT Modern Optics Seminar Series, April 2010.

“Raman Spectroscopy of Chirality-Enriched Single-Walled Carbon Nanotubes”, Tutorial Lecture, International Winterschool on Electronic Properties of Novel Materials, Kirchberg Austria, March 2010.

“Raman Studies of Exciton and Exciton-Phonon Coupling Behavior in Metallic Single-Walled Carbon Nanotubes”, American Physical Society March Meeting, 2009.

“Curvature Effects on the 3rd and 4th Optical Transitions in Semiconducting Single-Walled Carbon Nanotubes”, NT’08: 9th International Conference on the Science and Applications of Nanotubes, Montpellier, France, July 2008.

Selected Publications (75 Total, >1800 citations)

Haroz, E.H.; Rice, W.D.; Lu, B.Y.; Hauge, R.H.; Ghosh, S.; Weisman, R.B.; Doorn, S.K.; Kono, J.; “Enrichment of Armchair Carbon Nanotubes via Density Gradient Ultracentrifugation: Raman Evidence”, *ACS Nano*, **2010**, *4*, 1955.

Niyogi, S.; Densmore, C.G.; Doorn S.K.; “Electrolyte Tuning of Surfactant Interfacial Behavior for Enhanced Density-Based Separations of Single-Walled Carbon Nanotubes”, *J. Am. Chem. Soc.*, **2009**, *131*, 1144.

Kilina, S.; Tretiak, S.; Doorn, S.K.; Luo, Z.; Papadimitrakopoulos, F.; Piryatinski, A.; Saxena, A.; Bishop, A.R.; “Cross-Polarized Excitons of Carbon Nanotubes”, *Proc. Nat. Acad. Sci.*, **2008**, *105*, 6797.

Haroz, E.H.; Bachilo, S.; Weisman, R.B.; Doorn, S.K.; “Curvature Effects on the E₃₃ and E₄₄ Exciton Transitions in Semiconducting Single-Walled Carbon Nanotubes”, *Phys. Rev. B*, **2008**, *77*, 125405.

Araujo, P.T.; Doorn, S.K.; Kilina, S.; Tretiak, S.; Einarsson, E.; Maruyama, S.; Chacham, H.; Pimenta, M.A.; Jorio, A.; “Third and Fourth Optical Transitions in Semiconducting Carbon Nanotubes”, *Phys. Rev. Lett.*, **2007**, *98*, 067401.

Shreve, A.P.; Haroz, E.H.; Bachilo, S.M.; Weisman, R.B.; Tretiak, S.; Kilina, S.; Doorn, S.K.; “Determination of Exciton-Phonon Coupling Elements in Single Walled Carbon Nanotubes Via Raman Overtone Analysis”, *Phys. Rev. Lett.*, **2007**, *98*, 037405.

O’Connell, M.J.; Eibergen, E.E.; Doorn, S.K.; “Chiral Selectivity in the Charge Transfer Bleaching of Single Walled Carbon Nanotube Spectra”, *Nature Materials*, **2005**, *4*, 412.

Doorn, S.K.; O’Connell, M.J.; Zheng, L.; Zhu, Y.T.; Huang, S.; Liu, J.; “Raman Spectral Imaging of a Carbon Nanotube Intramolecular Junction”, *Phys. Rev. Lett.*, **2005**, *94*, 016802.