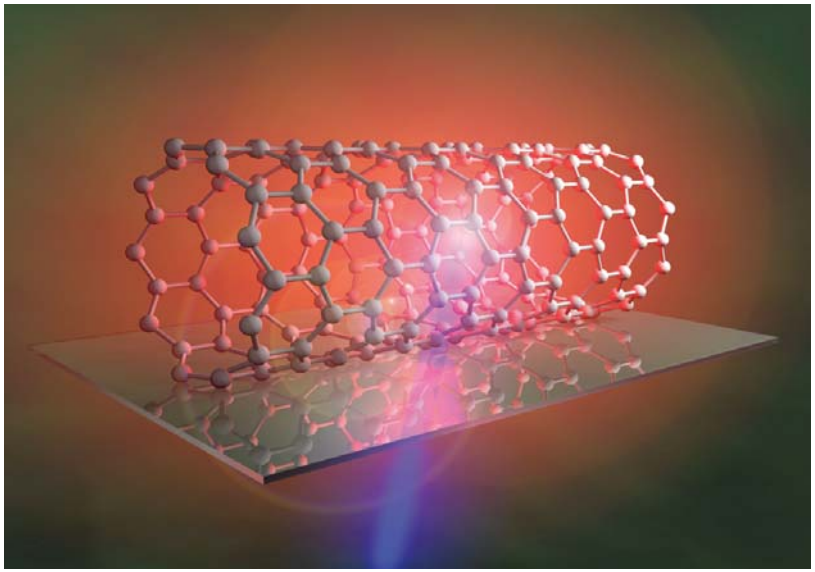
The Institute of OPTICS

Colloquium

University of Rochester

Are Carbon Nanotubes Useful Optical Materials?



Todd Krauss

Associate Professor of Chemistry
University of Rochester

PhD Cornell, 1998
Postdoc Columbia
U of R, 2000 -

This talk reviews the photo-physics of individual single-walled carbon nanotubes and their applications in biomedical imaging, lasers and optical amplifiers, and quantum optics.

3:00 pm, Monday, March 24, 2008
Sloan Auditorium, Goergen Building
Refreshments following lecture

Are Carbon Nanotubes Useful Optical Materials?

Professor Todd Krauss
Department of Chemistry, University of Rochester

Abstract

Single-walled carbon nanotubes (SWNTs) are tubular graphitic molecules with exceptional and unusual mechanical, electrical, and optical characteristics. For instance, nanotubes can be either metallic or semiconducting depending on their particular molecular structure. We will present several aspects of the photophysics of individual single-walled carbon nanotubes: their fundamental optical excitations (which are one-dimensional bound electron–hole pairs), their robust and unexpectedly unwavering single molecule fluorescence in the near-infrared, and their excited state dynamics on ultrafast time scales, including the observation of a quantized annihilation of multiple electron–hole pairs. The relevance of these photophysical properties with respect to potential applications in biomedical imaging, lasers and optical amplifiers, and quantum optics will be discussed.

Biography

Todd D. Krauss is an Associate Professor of Chemistry at the University of Rochester. He received his B.S., M.S., and Ph.D. in Applied Physics all from Cornell University, the latter under the advisement of Frank Wise. Upon graduating in 1998, he moved to Columbia University, serving as a postdoctoral fellow under Louis Brus until 2000 when he joined the Chemistry faculty at the University of Rochester as an Assistant Professor. Krauss's research interests involve fundamental studies of materials at the nanometer scale, down to the single molecule level, with a specific emphasis on single walled carbon nanotubes and semiconductor quantum dots. In addition, he is pursuing applications for these nanometer scale materials in the general areas of novel biological sensors and nanophotonics. Krauss's honors include a Camille Dreyfus Teacher-Scholar Award, an Alfred P. Sloan Research Fellowship, a James D. Watson Investigator Award, an Army Young Investigator Award, and a Research Innovation Award.