

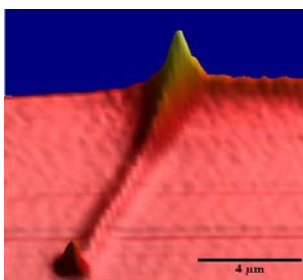
## SEMINAR

# Multi-probe Integration of Near-field and Electron Optics: Transport Imaging for the Nanoworld

Speaker	Nancy M. Haegel, Center Director, Materials Science, National Renewable Energy Laboratory (NREL), Colorado, USA
Moderator	Corsin Battaglia
Date	Tuesday 15.3.2016, 13:00
Venue	Empa, Dübendorf, room MO 235

## Abstract

Integration of near-field scanning optical microscopy (NSOM) with the imaging and localized excitation capabilities provided by electrons in a scanning electron microscope (SEM) offers new opportunities for the direct observation of highly resolved energy transport. We utilize the flexibility inherent in the independent, high resolution placement of the electron beam (for the generation of free carriers, photons and/or plasmons), in combination with scanning of an NSOM tip, to enable unique types of dual-probe experiments. This “transport imaging” is related to, but different from standard cathodoluminescence, because it maintains the spatial information in the emitted light. One can “see” the transport of carriers and determine minority carrier or exciton diffusion lengths from a single picture and map spatial variations in drift and diffusion behavior properties. Transport can be imaged in materials of all dimensions - bulk, thin films and nanostructures - with the use of appropriate models. These applications will be illustrated with examples from ordered alloys, multi-junction solar cells and GaN and ZnO nanostructures. In addition, a short overview of the work of the National Renewable Energy Laboratory (NREL) in the area of fundamental and applied materials science discovery and problem-solving for current and next-generation renewable energy and energy efficient technologies will be provided.



Spatial carrier diffusion and optical wave-guiding in a ZnO nanowire in response to point source e-beam excitation.

## Bio

Nancy M. Haegel is Center Director for the Materials Science Center in the Materials and Chemical Sciences Directorate at the National Renewable Energy Laboratory (NREL). She leads an organization of ~ 90 staff, associates and post-doctoral and graduate students providing fundamental and applied materials science discovery and problem-solving for current and next-generation renewable energy and energy-efficient technologies. Haegel joined NREL in 2014, after ten years at the Naval Postgraduate School in Monterey California, where she was a Distinguished Professor in the Physics Department. She has also been a faculty member at UCLA and Fairfield University. Her research interests are in electronic materials and devices, with emphasis on transport characterization, high resistivity semiconductors and infrared imaging and detection. Haegel is the author or co-author of ~ 130 publications. She is currently a member with of the Board of Trustees of the University of Notre Dame and was a 2012 Fulbright Senior Scholar at Hebrew University in Jerusalem.

Nancy received her BS degree in Metallurgical Engineering and Materials Science from the University of Notre Dame and a PhD in Materials Science from the University of California, Berkeley.