IEEE Lasers and Electro-optics Society Hangzhou Chapter

The IEEE LEOS Hangzhou Chapter and Joint Research Centre of Photonics of the Royal Institute of Technology (Sweden) and Zhejiang University (China)

Joint Research Center of Photonics

Date : 26 July, **2007 (** Thursday **)**

Time : 10:00**am-11:30am**

Location : Room 326, Teaching Building # 3, Yuquan campus, Zhejiang University

Nanowires and nanolasers: how small can they be?

An IEEE Lasers and Electro-Optics Society Distinguished Lecture

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Abstract

The pursuit of nanotechnology in general and miniaturization of electronic devices in particular have seriously challenged the optoelectronics community to develop ever smaller lasers and optoelectronic devices compatible with the trend in microelectronics. Vertical-cavity surface emitting lasers measured a few microns were once the smallest lasers. The situation is now rapidly changing over the last 5 years with the demonstration of lasing capability of a single semiconductor nanowire of ~ 100 nanometers in diameter. The ultimate challenge to the community is: can one make a laser that is smaller than the wavelength in all 3 dimensions, or what is the ultimate size limit of a laser?

To answer this and related questions, my lecture will start with impressive recent progress in growth, fabrication, and characterization of semiconductor nanowires and demonstration of lasing activities in various wavelengths. These lasers represent the smallest lasers of any kind at present. We will show how this new type of miniaturized lasers differs from the conventional semiconductor lasers. To further reduce the dimension of nanowire lasers, a recent proposal of using metal coating of semiconductor wires will be evaluated by numerical simulation. We will show that a proper design of a metal coated semiconductor nanowire can achieve lasing threshold despite significant metal loss. Finally some recent novel ideas involving surface plasmonic excitations at metal-semiconductor interface will be discussed where much smaller lasers could be potentially made, with size independent of wavelengths.

About the speaker

Dr. Ning obtained his PhD in Physics from University of Stuttgart. He was a Senior Scientist, group leader, or task manager at NASA Ames Center for Nanotechnology, NASA Ames Research Center from 1997-2006. He joined Arizona State University in 2006, where he is a Professor of Electrical Engineering with the Center for Nanophotonics, Arizona Institute of NanoElectronics and Center of Solid State Electronics Research (CSSER).

Dr. Ning has been conducting research in the general fields of laser physics, semiconductor lasers, optoelectronic device modeling and simulation for the last 20 years. Recently, he has developed a significant experimental program in semiconductor nanowire research, growing and optically characterizing semiconductor nanowires. His group was the first to grow antimonide

nanowires and first to demonstrate a single-nanowire infrared laser. He has published 120 scientific papers and given many conference presentations including ~50 invited talks. He has served in many international conference committees including SPIE Photonics West, OSA annual meetings, and CLEO. He was Associate Editor of IEEE J. Quantum Electronics (2001-2003). He also served as a special topic editor for a few journals including IEEE J. Special. Topics in Quantum Electron., J. Opt. Soc. Am., Optics Express, etc. For his research at NASA, he has won many NASA and NASA contractor awards, including NASA Group Achievement (1999) award and CSS Technical Excellence Award (2003). He was recently awarded the IEEE/LEOS Distinguished Lecturer (2007/2008).

ALL ARE WELCOME!

Host: Prof. Limin Tong (Tel: 0571-87952016; Email: phytong@zju.edu.cn)
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