CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

University of Illinois at Urbana-Champaign

CENTER FOR NANOSCALE CHEMICAL-ELECTRICAL-MECHANICAL MANUFACTURING SYSTEMS

Engineering Optical Performance at the Nanoscale: Quantum Dots Photonic Crystal Resonators

The interaction between quantum dot emitters and carefully constructed optical resonators can result in profound changes in the optical behavior of the system, influencing factors as fundamental as the spontaneous lifetimes of the emitters. The very narrow width of the quantum dot emission peaks, together with the very high optical selectivity that can be exercised by high quality resonators make it possible not only to tune the fundamental optical properties of the quantum dots, but also suggest various information processing approaches. This talk will describe recent results achieved for MBE-grown InAs quantum dots embedded within optical cavities fabricated from GaAs photonic crystal material. The most dramatic interactions occur when the quantum dot emitters and the optical cavity are 'strongly coupled'. These conditions occur when there is a resonance in the frequency of the quantum dots and the frequency of the cavity mode, as well as a spatial coincidence of the quantum dot with the location of maximum mode strength. Recent work in the 'active' positioning of quantum dots within the cavities will also be highlighted.

Evelyn L. Hu

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Co-Director of the California NanoSystems Institute (CNSI)
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Professor Hu received her B.A. in Physics (summa cum laude) from Barnard College and her M.A. and Ph.D. in Physics from Columbia University. From 1975-81, Dr. Hu was a Member of Technical Staff at Bell Laboratories at Holmdel, NJ. From 1981 to 1984 she served as a Supervisor for VLSI Patterning Processes at Bell Laboratories at Murray Hill, NJ. In 1984 she joined UCSB as a Professor of Electrical and Computer Engineering (ECE). She currently holds joint appointments in ECE and Materials, and is the Scientific Co-Director of the newly-formed California NanoSystems Institute, a UCLA-UCSB collaborative California Institute for Science and Innovation.

Her research has focused on the fabrication of electronic and photonic structures at the nanoscale and the utilization of physical behavior manifest in structures of reduced dimensions (such as ballistic electron transport or changes in radiative lifetimes). Most recently her work has involved the interaction of quantum dots in high Q microdisk and photonic crystal cavities, forming the basis for low threshold optical devices, and possible single photon sources.

She serves as a Councillor for the American Physical Society, is on the Board of Reviewing Editors for Science, and on the editorial board for the Virtual Journal of Nanoscale Science & Technology. She is a member of the National Academy of Engineering, a recipient of the AAAS Lifetime Mentor Award, a Fellow of the IEEE, APS, and the AAAS, and holds an honorary Doctorate of Engineering from the University of Glasgow.

Wednesday, October 13, 2004
4:00 p.m.
B02 Coordinated Science Lab

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