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BIG energy seminar series

Addressing the scale and complexity of the global energy challenge.

Quantum dots and liquid crystals: applications in solar concentrators and other hybrid devices.

Linda S. Hirst
University of California, Merced

Date: Wednesday April 2, 2014 at 12:00 pm
Location: Duane Physics, Gamow Tower, 11th floor Commons Room

Abstract:

Controlling the dispersion and assembly of interacting nano-particles is an important goal in materials science as we aim to develop organized NP lattices for a variety of materials applications. Liquid crystal materials can be used to both organize quantum dots and to control and direct their emission. Luminescent solar concentrators (LSCs) have been widely investigated due to their potential in dramatically decreasing the cost of collecting solar energy and recently we have investigated liquid crystal/QD hybrid materials as an interesting model system for the design of solar concentrators.

In this talk I will discuss recent results from our group in QD dispersion and assembly using liquid crystals as an active medium to form hybrid solid state/liquid crystal materials, recent progress in QD functionalization with mesogenic ligands and device applications using these materials. Our group uses fluorescence and polarized microscopy, photoluminescence confocal microscopy and time resolved spectroscopy to look at the emission of QDs in the nematic, and cholesterol phases. Synchrotron x-ray diffraction allows further investigation of the hybrid materials' structure, probing QD organization within the liquid crystal.

Bio:

Professor Hirst is a soft-condensed matter physicist. Her research group uses experimental and computational techniques to characterize molecular assemblies and uncover how self-organization at a molecular level can define complex structures in real biological systems and soft materials. In addition to her research interests Prof. Hirst is also the creator of softmatterworld.org, an educational networking site for the soft matter community around the world. She gained her Ph.D. in 2001 from Manchester University, UK with Prof. Helen Gleeson in Liquid Crystal materials. Dr. Hirst studied biomaterials (postdoctoral work) at the Materials Research Laboratory at UC Santa Barbara with Prof Cyrus Safinya. In 2012, she published her first book, "Fundamentals of Soft Matter Science".

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