Seminar

Title： Doping Colloidal Semiconductor Nanocrystals

Speaker： Prof. David J. Norris
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Time： **10:00-11:30 (am) Sep. 5, 2011（Monday）**

Place： **Meeting room 308, IPE Mansion**

Abstract

Doping is extremely important for controlling the electronic conductivity of bulk semiconductors. However, very few examples exist where impurities that have been incorporated into colloidal semiconductor nanocrystals affect their electronic properties. Here we will discuss the challenges in this area and recent progress. In particular, we will describe an approach to lightly dope semiconductor nanocrystals with a controllable amount of electronic impurities. The physical characterization of these materials then shows that the addition of even one impurity per nanocrystal has a dramatic effect on their optical properties. Furthermore, studies of the electrical transport through films of these nanocrystals reveal complex behavior in the Fermi level as a function of dopant concentration. Using techniques to characterize the crystal structure near the impurities, their location within the nanocrystal was determined. These results are consistent with the physical properties and together can explain the observed optical and electrical trends. However, the results also show that dopant behavior in nanocrystals is not as simple as one might expect. Thus, these experiments begin to reveal the properties of a new class of nanocrystal materials that may be important for future nanocrystal devices.

Introduction

David J. Norris was elected Professor of Materials Engineering at the Swiss Federal Institute of Technology (ETH Zürich) in March, 2010. He is currently the Director of the Optical Materials Engineering Laboratory in the Department of Mechanical and Process Engineering. Prof. Norris received his B.S. in Chemistry from the University of Chicago in 1990. He then pursued a Ph.D. in Physical Chemistry at MIT, graduating in 1995. After a National Science Foundation postdoctoral fellowship at the University of California, San Diego, he joined the NEC Research Institute in Princeton, New Jersey, where he started a research effort on optical materials in 1997.

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