Ultrafast Spectroscopy of Semiconducting Nanoparticles and Organic Polymers

By

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Abstract:

Our research involves investigating the energy transfer processes in semiconducting nanoparticles, electroluminescent polymers and organic-based photovoltaic compounds. The samples are probed by femtosecond laser pulses as well as short electrical pulses, which generate non-equilibrium states that can be monitored by time-resolved spectroscopy. Work on doped semiconducting nanoparticles and organic polymers will be presented in this talk:

1. Semiconducting Nanoparticles - Nanoparticles display a variety of unique optical and electronic properties that result from their quantum confinement effects and high surface/volume ratios. In this work, we investigate the decay lifetimes of the dopant and host semiconductor in the Mn$^{2+}$-doped ZnS nanoparticle system. In this system, the Mn$^{2+}$ ion acts as a luminescent center, emitting near 590 nm (orange) as a result of the $4T_1 \rightarrow 6A_1$ transition. We seek to better understand the energy transfer mechanisms between the host and the dopants in nanoparticle systems so as to enhance their luminescence efficiencies.

2. Organic Polymers – Rare-earth (RE) doped organic molecules display unique narrow band emissions that originates from the 4f transitions of the RE ions. RE complexes also possesses emissive bands which span a wide wavelength range (from visible to NIR), and can be useful for application in OLED. In this work we seek to better understand the energy transfer processes between the host and the RE dopants through ultrafast spectroscopy. The knowledge gained will lead to more efficient and durable OLEDs. Results from the newly established streak camera based time-resolved electroluminescence technique will also be presented.

Date: Friday, 28 March 2008
Time: 9.30am to 10.30am
Venue: PAP Meeting Room (SBS b3n-19)

Hosted by Prof Alfred Huan