TIFR Centre for Interdisciplinary Sciences
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Seminar

Strategy to tune cooperativity in Spin-crossover compounds and equilibrium dopant composition in Semiconductor Nanocrystals

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The spin-crossover process involves the rearrangement of electrons within metal d-orbitals from the high-spin to the low-spin configuration corresponding to the distribution that yields maximum and minimum number of unpaired electrons respectively. The relative population of the spin states is a function of various external perturbations such as temperature, magnetic fields, external pressure, and light irradiation. In the first part of the talk, the thermal and photo-induced spin switching dynamics and the variation of the cooperative effects in the spin-crossover coordination networks will be discussed.

On the other hand, intentional incorporation of dopants into the semiconductor nanocrystals can dramatically alter the electronic, optical, magnetic, and electrical properties. Enormous efforts and many attempts have been made to dope semiconductor nanocrystals with transition metal ions by means of colloidal chemical synthesis. Despite these efforts, successful dopant incorporation into host nanocrystals remains a challenge. The primary challenges are associated with unfavorable impurity/host competition kinetics during nanocrystal growth. To overcome these challenges, a qualitatively new method of nanocrystal diffusion doping under thermodynamic control has recently been developed. The second part of the talk focuses on broadening the scope of this powerful chemistry, in conjunction with cation exchange chemistries, to allow dopants to be incorporated into the host nanocrystal lattice, thereby providing a general methodology for controlling dopant composition under thermodynamic equilibrium. In addition, mechanistic understanding of the dopant ion diffusion in these nanocrystals will be discussed.

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4:00 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS