ASET Colloquium

Raman Tracking of Photoinduced Charge Transfer States in Molecular Systems
by Dr. Jyotishman Dasgupta (DCS, TIFR)

Friday, 14 July 2017 from 16:00 to 17:00 at AG-66

Abstract:

Our current energy demand requires development of efficient solar conversion technologies for electricity generation. Although Si-based solar cells provide access to robust photovoltaic devices, the fabrication cost of crystalline Si prohibits its large scale usage. Chemists alternatively have championed the use of organic semiconductors as light harvesting materials since they are synthetically tunable and cheaper to fabricate. However, one of the critical bottlenecks in such organic systems is the large exciton (bound electron-hole quasiparticle) binding energy which prevents generation of free charges. It has been argued that charge transfer (CT) states harnessed at molecular donor-acceptor interfaces will lead to instantaneous charge generation for photovoltaic applications by lowering the exciton binding energies. To comprehensively understand and subsequently tune the lifetime/energies of these CT states, spectroscopic techniques have to be developed to unravel the lengthscale of charge polarization in the molecular backbone and their associated structural dynamics. In this talk, I will present the development of a time-resolved Raman spectrometer at TIFR that directly accesses this information in a variety of small donor-acceptor dyads as well as in polymeric organic semiconductors. At the end, I will discuss how the obtained molecular coordinate information from such Raman measurements paves the way for improved charge generation in organic solar cells and efficient photocatalysis.