SPECIAL PHYSICAL CHEMISTRY SEMINAR

Tuesday
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3:30 pm

Room 9341
Chemistry

Ultrafast dynamics in molecules and materials

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Host: Marty Zanni

This talk embodies glimpses of our work on the ultrafast dynamics on molecules and materials. Two types of molecules will be discussed. The first consists of Epicocconone and its derivatives: these are second generation protein stains. The principal nonradiative channel of these molecules has been identified to be photoisomerization, with a time constant of 1 ps. A slightly longer timescale of 70 ps is associated with flexing motion of the fused ring system of the molecules. In conjugates of these molecules with proteins and amines, this motion leads to a brightly fluorescent state with nanosecond lifetime. The second class of molecules comprises pyridylbenzimidazoles, in which the conformational dynamics have been shown to be an important determinant of the excited state proton transfer. These molecules have been used to understand the dynamics of water in the nanochannels of nafion membrane. Yet another class of molecules that we have studied is aminoquinolines, which exhibit faster nonradiative rates in nonpolar solvents and slower ones in polar and especially protic solvents. Positional isomerization, which governs the intermolecular or intramolecular nature of hydrogen bonds, plays and important role in the ultrafast dynamics of these molecules. On the materials front, we have studied the dynamics of trapping processes that lead to brightly fluorescent amorphous silica nanostructures. High efficiency and ultrafast dynamics of FRET have been studied in dye-silica nanoconjugates, which have potential use as light-harvesting nanoantennae. The role of shape, size and extent of dye-loading will be discussed. We will also present our results on highly fluorescent nanorods of an organic molecule, which exhibits aggregation – induced fluorescence. Preliminary data on the ultrafast dynanics in luminescent carbon nanostructures will also be presented.