Abstract

Fluorescence spectroscopy has been widely used in chemistry and biology for studying the conformations and dynamics of molecules in complex systems. The confinement of biomolecules in restricted environments and the surrounding water molecules play an important role in controlling their structure, reactivity and dynamics. The organized assemblies such as, micelles, reverse micelles, microemulsions, mixed micelles and vesicles have ability to confine a probe within the solvent molecules of its small region. Using these organized self-assemblies as bio-mimicking model membrane systems, we have demonstrated the effect of confined microenvironments on various biologically important dynamical processes such as excited state intermolecular proton transfer (ESIPT), photoinduced electron transfer (PET), fluorescence resonance energy transfer (FRET), solvation dynamics and conformational dynamics of protein. We have shown how excited state proton transfer dynamics of firefly's chromophore D-Luciferin is influenced in confined microenvironments like AOT reverse micelles. ESIPT choromophore D-Luciferin has been further used as a highly microenvironment sensitive probe to understand the structural transition of DMSO-water binary solvent mixtures. The effect of confinement on PET dynamics is also investigated in the AOT reverse micelles. FRET has been utilized to characterize different organized assemblies like surface active ionic liquid (SAIL) micelles and vesicles. We have also demonstrated how the dynamics of water changes surrounding the self-assemblies upon micelle-vesicle transition of zwitterionic surfactant, *N*-hexadecyl-*N, N*-dimethylammonio-1-propanesulfonate (SB-16) in presence of Poly−L−lysine (PLL). Fluorescence correlation spectroscopy (FCS) serves as an effective tool to measure dynamics and hydrodynamics of biomolecules. Using this FCS and fluorescence lifetime imaging microscopy (FLIM), we have conducted the conformational dynamics of bovine serum albumin (BSA) on graphene oxide (GO) surfaces.

Keywords: Organized Assemblies, Time-resolved Fluorescence Spectroscopy, Surface Active Ionic Liquids, Fluorescence Correlation Spectroscopy, Fluorescence Lifetime Imaging Microscopy