



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.
Thesis Title: **Probing Structural Reorganization and Hydration inside Triblock Copolymer-Surfactant, Polyelectrolyte-Surfactant Assemblies using Excited-State Proton Transfer of Pyranine**
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SHORT ABSTRACT

The thesis represents the application of excited-state proton transfer (ESPT) of a photoacid 8-hydroxypyrene-1,3,6-trisulfonate (HPTS) to explore structural reorganization and hydration changes that occurs during the interaction of a triblock copolymer or a polyelectrolyte with different surfactants. The emission property of the fluorophore is susceptible to minute changes in the local hydration, enabling the detection of delicate changes in the polymer-surfactant or polyelectrolyte-surfactant assembly due to variations of chain length or headgroup charges of the surfactants. The investigations can also predict the most compact assembly, which can be important for various applications such as drug delivery systems and nanostructure templates. The content of the thesis is divided into seven chapters.

Chapter 1 briefly reviews the recent experimental investigations and molecular dynamics in mixed aggregate formulations of the triblock copolymer, polyelectrolyte molecules, and various short-chain ionic, zwitterionic surfactants. *Chapter 2* describes the chemicals used in the experiments, measurement techniques, data analysis and interpretation methods. *Chapter 3* deals with the interaction pattern of cationic surfactant dodecyl trimethylammonium bromide (DTAB) with pluronic triblock copolymer F127 (poly-(ethylene oxide)₁₀₁ (EO)₁₀₁-poly(propylene oxide)₅₆ (PPO)₅₆-PEO₁₀₁). Anomalous ESPT dynamics variation was observed with the composition of the assembly. *Chapter 4* describes the effect of chain length variation of cationic surfactants and initial concentrations (premicellar or post micellar) of F127 on interaction pattern, subsequently, application of these micelles to anisotropic gold nanostructure synthesis. *Chapter 5* describes how surfactant headgroup charge impacts the interaction between homolog surfactants and pluronic F127. *Chapter 6* includes the effect of salt on the variation of the ESPT dynamics pattern of zwitterionic surfactant-pluronic F127. In *Chapter 7*, we explored the ESPT dynamics at the interface of polyelectrolyte-surfactant assembly. By observing the TRANES isoemissive point shift, transfer of the probe between micelle and polyelectrolyte was proposed.