INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Synthesis and photophysical investigations of silver nanoparticles inside aqueous and acetonitrile microemulsion

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SHORT ABSTRACT

The thesis describes a facile synthesis of silver nanoparticles (AgNPs) within both aqueous and non-aqueous microemulsions with very high optical quality, which are subsequently used to perform several photophysical studies. The content of the thesis has been spread into seven chapters. In *Chapter 1,* a brief introduction of optical properties of metal nanoparticles (MNPs), structural and dynamical characteristics of microemulsions, primarily formed by an anionic surfactant sodium dioctylsulfosuccinate (AOT) and its applications in synthesis of various nanoparticles is provided. Details of instrumental techniques and measurement methods have been summarized in *Chapter 2*. In *Chapter 3*, a facile synthesis protocol is demonstrated to obtain superior optical quality AgNPs inside water/AOT/*n*-heptane reverse micelles (RMs). The growth of the AgNP within the RMs core may severely influence the structural organization of the reverse micellar interface. The modification of the interfacial layer associated with nanoparticle formation has been probed by a solvatochromic probe coumarin 343 (C343) in the *Chapter 4.* In the *Chapter 5*, application of superior optical quality AgNPs is demonstrated in plasmon- fluorophore interaction by exploiting the natural confinement of RM to act simultaneously as a template for AgNP and to host the fluorophores. In the succeeding *Chapters,* I intend to produce high optical quality AgNPs inside a non-aqueous acetonitrile/AOT/*n*-heptane microemulsion. However, nature of the microemulsion template remains debated in the literature and hence, first probed the morphology of the acetonitrile microemulsion at different w_s (= [acetonitrile]/[AOT]) using a solvatochromic probe 4-aminophthalimide (4-AP) in *Chapter* 6. It is observed that the microemulsion undergoes a morphological transition from RM to bicontinuous microemulsion (BMC) above a certain w_s. Finally, in *Chapter* 7, synthesis of AgNPs has been performed in the microemulsion at various w_s and it is found that structural and optical properties of the synthesized AgNPs correlate nicely with the microemulsion template morphology proposed in the *Chapter 6.*