



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Complexation on the Surface of Zinc Chalcogenide Quantum Dots: Binding, Kinetics and Application

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SHORT ABSTRACT

This thesis is a description of the complexation reaction on the surface of zinc sulphide quantum dot (Qdot), its physical insight and its application. It was found that the zinc quinolato complex was possibly attached on the surface of ZnS Qdot as Z-type ligand through dangling sulfide maintaining 1:2 (metal:ligand) stoichiometry. It was demonstrated that copper quinolato complex can react with surface Zn^{2+} ion to form surface zinc quinolato complex – which is impossible in normal condition as per Irvin William series. It has been reported that ligand (i.e. 8-hydroxyquiniline and its derivative) can be migrated from surface of ZnO to ZnS in the form of complex. It happened due to relative stability of surface complexes (zinc quinolato) on the surfaces of different quantum dots. Through these studies, it was revealed that the surface dangling anions play an important role in providing the stability of zinc quinolato complex while attached on the surface of nanocrystals. We have also followed the kinetics of the complex formation and ligand migration reaction by time dependent photoluminescence study. In addition, we have observed presence of two different species (i.e. Qdot and surface complex) in quantum dot complex (QDC) at a few particle level by studying the photoluminescence intermittency of QDC in two different emission channel. Finally, concept of surface complexation was successfully used to design ZnO based white light emission, to formulate sun protection formula from ZnO herbal nanocomposite.