INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	**PRIYANKA SARKAR**
Roll Number	:	186122046
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Name of Thesis Supervisor(s)	:	Prof. KALYANASIS SAHU
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SHORT ABSTRACT

The contents embodied in this thesis is divided into seven chapters. Chapter 1 is an introductory chapter which gives a concise and lucid introduction to the field and reports the major scientific contributions relevant to metal Nanoclusters. The introductory chapter represents an overview of the synthesis procedures, photo-physical properties, factors affecting its photo-physical properties and applications of these metal nanoclusters to diverse fields. Chapter 2 provides a detailed description of the material and methods used throughout the thesis. Chapter 3 describes synthesis of a biocompatible DTT (Dithiothreitol)-reduced LYS(Lysozyme) capped silver nanoclusters(AgNCs) and its application for selective and sensitive detection of Cu^{2+} and VB12. Detailed detection mechanism was studied. These AgNCs were also able to detect Cu^{2+} and VB12 inside live cells as well. Chapter 4 describes synthesis of a DTT reduced BSA(Bovine Serum Albumin) capped dual-emissive AgNCs and its application for selective and sensitive ratiometric detection of Cu^{2+} and IO_4^-. Detailed detection mechanism was studied. Chapter 5 describes a top-down synthetic approach to synthesize time-controlled two differently emissive copper nanoclusters (green and blue CuNCs) from a non-luminescent copper nanoparticles(CuNPs). Later, blue emissive CuNCs were utilized for detection of Fe^{3+} and GSH(Glutathione) via fluorescence turn-off-on mechanism. Detailed detection mechanism was studied. Chapter 6 reports two different strategies to produce AIDF (Aggregation induced delayed fluorescence)-based luminescent materials at room temperature from GSH-capped CuNCs by (1) simply modifying the solvent environment and (2) introducing of gadolinium (Gd^{3+}) ions. Detailed analysis were investigated to reveal the generation mechanism of these AIDF properties. Further, Gd^{3+} induced AIDF of GSH-CuNCs were utilized to selectively detect Cr^{+6} ions. Chapter 7 provides a concise summary with future prospects.