INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Luminescent Gold and Copper Nanoclusters for Theranostic Applications

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SHORT ABSTRACT

The present thesis entitled "**Luminescent Gold and Copper Nanoclusters for Theranostic Applications"** emphasizes on synthesis and development of different types of metal nanoclusters (Au and Cu) and their potential applications. The thesis is organized in five chapters where **Chapter 1** provides introduction and insights of luminescent metal nanoclusters, and it's various applications in the field of bacterial detection, enumeration, distinction of antibiotic resistant strains, white light emission, electro chemical biosensing, bioimaging, therapeutics, and in the fields of theranostics for cancer therapy.**Chapter 2** begins with a new facile method of synthesis of luminescent gold nanoclusters (Au NCs) taking bacteria as template where the luminescence property of the as-synthesized Au NCs was probed for bacterial detection and counting, offering a quick method to enumerate the number of bacteria present in the samples. Additionally, the method was employed for distinction between the Gram strains and for detection of bacterial contaminants from water sources and kanamycin resistant strains rapidly.**Chapter 3,** introduced the concept of white light emission from a unicellular living organism functionalized with gold nanoclusters Au NCs. The bacterial cell wall with Au NCs synthesized on it, emitted white light associated with high quantum yield and chemical stability.**Further, in Chapter 4** spherical luminescent drug encapsulated composite nanoparticles (PEG-Au NC-NaB-NPs) were synthesized for synergy of action and the mechanism of cell death was also studied in detail along with inspired trials for *in vivo* mice bearing Dalton's lymphoma ascites (DLA) tumors.**Chapter 5** demonstrates novel synthesis of blue emitting transferrin stabilized copper nanoclusters, which were further formulated into spherical transferrin copper nanocluster-doxorubicin nanoparticles (Tf-CuNC-Dox-NPs) or nanodrug for efficacious targeted delivery. The uptake and release of Dox from the nanoparticulate system was monitored by Förster resonance energy transfer (FRET) assisted bioimaging.The Tf-CuNC-Dox-NPs evinced synergistic anticancer activity involving Tf-CuNCs and Dox where mechanism of its action was also elucidated in details. The work was complemented with detailed *in vivo* studies on TfR positive DLA mice model.