INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

This Thesis contains five chapters. Chapter 1 is about Introduction, Materials and Methods. In this chapter introduction about chemosensors and various sensing mechanisms are explained. Some recent literature reports based on metal ion, biothiols and phosphate sensing have been discussed. Along with this, materials, methods and instrumentation related to this thesis are described in detail. In Chapter 2, a chemosensor 3-hydroxy-N'-(11H-indeno[1,2-b]quinoxalin-11-ylidene)-2-naphthohydrazide (**LH**) was synthesized for selective colorimetric recognition of Cu^{2+} ion in MeOH/HEPES buffer system (1:1, *v/v*, pH = 7.4). Upon adding Cu^{2+} ion to the probe solution, a characteristic chromogenic change from colorless to yellow was observed. The *in situ* generated $[Cu(\mathbf{L})Cl(H_2O)_2]$ (complex **1**) was found to exhibit a discoloration, upon gradual addition of cysteine as well as ATP having 1:2 and 1:1 stoichiometry respectively. The binding ability of **LH** with BSA and HSA was examined by spectral and *in silico* docking analysis. Chapter 3 deals with the synthesis and characterization of a probe N-(naphthalen-1-yl)-2-(pyren-1-ylmethylene)hydrazine-1-carbothioamide ($\mathbf{L_1}$) and exhibited a significant aggregation induced emission (AIE) property in 7:3 water-EtOH mixture. The nano-structure aggregates formation exhibited a yellowish-green fluorescence upon excitation with 380 nm light. A colorimetric and a fluorescence turn-off response was observed with the gradual addition of Pd^{2+} ion in a colorless EtOH/aqueous HEPES buffer (3:7, *v/v*) solution of $\mathbf{L_1}$. The recognition of Pd^{2+} in real water and pharmaceutical drug samples also performed. In Chapter 4, a quinoline-linked benzimidazole scaffold AIE active probe 6-(quinolin-2-yl)-5,6-dihydrobenzo[4,5]imidazo[1,2-*c*]quinazoline

(**L2H**) is utilized as a fluorescent turn-on sensor for the selective detection of Al^{3+} ion and cysteine in surfactant medium. Cyclic bidentate probe (**L2H**) upon binding with Al^{3+}, converted to tridentate **L2′**, having an open structure and cysteine converted **L2H** to a fluorescent dimer (**L2–L2**). Various practical applications such as food and real water samples were also performed for rapid on-site detection of both analytes. In Chapter 5, the probe (**L3H**) having quinazolinone and 4-diethylaminophenyl moieties has exhibited selective recognition of As^{3+} ion in aqueous HEPES medium. The rapid on-site detection of As^{3+} ion was achieved using a smartphone-based portable sensing device.