INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Metal Ion Sensing, Coordination Chemistry of Some N-,O-Donor Ligands and Synthesis of Substituted Benzenes and Cyclohexanols**

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SHORT ABSTRACT

This Thesis contains six chapters. Chapter 1 is about Introduction, Materials and Methods. In this chapter, introduction about fluorescence and various sensing mechanisms are discussed briefly. Some recent literature reports on detection of Zn^{2+}, Cu^{2+} and Pd^{2+} ions using different fluorescent probes have been discussed. Recent reports on benzannulation reactions for the synthesis of substituted benzenes have also been described. In Chapter 2, a probe 3,3'-((-(5-(*tert*-butyl)-2-hydroxy-1,3-phenylene)bis(methaneylylidene))bis(hydrazin-1-yl-2-ylidene))bis(quinoxalin-2(1H)-one) (**LH**) showed very weak fluorescence (λ_{em} = 597 nm) in EtOH/HEPES buffer system (5 mM, pH = 7.4, 8:2, *v/v*) upon excitation with 419 nm light. Upon adding Zn^{2+} ion to the probe solution, a huge enhancement in fluorescence (λ_{em} = 537 nm) was observed. Job's plot and single crystal XRD method suggested a 2:1 binding ratio between Zn^{2+} and **LH**. A very low detection limit of 95 nM was calculated using **LH** for detection of Zn^{2+} ion. In Chapter 3, a heterocyclic probe 1-(imidazo[5,1-*a*]isoquinolin-3-yl)naphthalen-2-ol (**L2H**) has exhibited very high fluorescence in MeOH/HEPES buffer system (5 mM, pH = 7.4, 2:8, *v/v*) at λ_{em} = 437 nm when excited with λ_{ex} = 336 nm. But after addition of Cu^{2+} and Pd^{2+} ions the fluorescence got quenched. Job's plot and mass spectral analysis suggested a 1:2 binding ratio between M^{2+} (M = Cu, Pd) and **L2H**. DFT/TDDFT calculation supported the experimentally observed red shifts in absorption spectra due to addition of Cu^{2+} and Pd^{2+} ion to probe solution. In Chapter 4, a polypyridine ligand (**L3**) containing two terpyridine arms was synthesized and utilized in synthesis of two new metal complexes of Co(II) and Mn(II) with compositions $[M_2(\mathbf{L3})Cl_4]\cdot 2H_2O$. Molecular structures of these three were established using single crystal XRD method. Taking inspiration from synthesis of terpyridine, Chapter 5 deals with synthesis of 1,2,4,6-tetrasubstituted benzenes from the reaction of aryl methyl ketones and aromatic aldehydes in 3:1 ratio in the presence of 3 equivalents of NaH in one pot condition. The reaction was regioselective in nature. In Chapter 6, changing the ratio of aryl methyl ketone and aromatic aldehyde from 3:1 to 3:2 in the presence of catalytic amount of NaH yielded 1,2,3,4,5-pentasubstituted cyclohexanol. Using this methodology some new and reported substituted cyclohexanols were synthesized.