



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title:

**A Progressive Endeavor to Develop Efficient Organic Chromogenic and Fluorogenic Sensing Probes for Ionic and Neutral Guests**

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Thesis Submitted to the Department/ Center : CHEMISTRY

Date of completion of Thesis Viva-Voce Exam : 28/04/2017

Key words for description of Thesis Work : Chemosensor, Aggregation Induced Emission (AIE), Fluorescence

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SHORT ABSTRACT

The overall thesis elucidates some important results in the field of developing chemosensors for some important ionic and neutral guests. Some new aggregation induced emission (AIE) active probes (Schiff base) have been developed here and the role of AIE in sensing outcome to overcome aggregation caused quenching (ACQ) effect has been discussed. Majority of the probes, reported in this thesis have naked eye sensing ability. In general, the research works describe a clear insight of the design principle involved in developing simple optical sensing probes which can detect various ionic and neutral guests in fully or partially aqueous solution and/or inside living cells.

AIE-active probe **L**<sub>1</sub> exhibited a selective TURN-ON fluorescence response towards Al<sup>3+</sup> in solution and in live HeLa cells. Subsequently the highly emissive **L**<sub>1</sub>-Al<sup>3+</sup> ensemble were used to track the ct-DNA by a dose dependant fluorescence quenching. **L**<sub>1</sub> can also selectively sense Cu<sup>2+</sup> through sharp colorimetric response. So, basically **L**<sub>1</sub> is a metal ion responsive colorimetric and fluorescent probe which additionally can track DNA. On the other hand, a versatile fluorescent probe (**L**<sub>2</sub>) has demonstrated highly sensitive dual yet discerning sensing of SO<sub>3</sub><sup>2-</sup> and SO<sub>4</sub><sup>2-</sup>/HSO<sub>4</sub><sup>-</sup> over competing analytes with beneficial attributes such as sensing in completely aqueous medium and an extremely fast response time. Moreover, **L**<sub>2</sub> holds considerable potential as an analytical tool to investigate the physiological implications of sulfate/sulfite derivatives in cell by demonstrating differential intracellular sensing of SO<sub>3</sub><sup>2-</sup> and SO<sub>4</sub><sup>2-</sup>. Another AIE active probe **L**<sub>3</sub> can sense multiple targets at a time. It can sense cations Al<sup>3+</sup> and Zn<sup>2+</sup> through individual Turn-On fluorescence responses and Cu<sup>2+</sup> through colorimetric changes. Interestingly, **L**<sub>3</sub> can also selectively sense anion fluoride by specific colorimetric response. Lastly, sensing probe **L**<sub>4</sub> can discriminate geometrical isomers (Maleic Acid vs Fumaric Acid) by colorimetric as well as fluorescent changes as it can detect Maleic Acid over various other carboxylic acids in solution and food additives.