



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : **Niranjan Meher**
Roll Number : **146122018**
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Name of Thesis Supervisor(s) : **Prof. Parameswar Krishnan Iyer**
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SHORT ABSTRACT

The research works presented in this thesis is focused on developing new strategies to control the ACQ/AIE phenomenon in naphthalimide (NI) derivatives. In particular, these research projects include the systematic tuning of condensed state properties and supramolecular self-assembly of the NIs by simple yet judicious structural manipulations. It has been unveiled that the intermolecular packing orientations play a significant role to control the supramolecular self-assembly and photophysical properties of the NIs over the electronic influence of the attached motifs. Apart from the different strategies developed to generate and tailor the condensed state properties of the NIs, the spontaneously formed fluorescent nanoassembly of the NIs have been employed for the detection of various environmentally toxic and biologically active analytes in physiological conditions.

The content of this thesis entitled “*Naphthalimide Luminogens: Structure-Property Relationships and Sensing Applications*” has been divided into five chapters. *Chapter 1* commences with a brief essay on the need and discovery of condensed state emission followed by its mechanistic aspects, applications and a short briefing on naphthalimide luminogens. *Chapter 2* demonstrates the influence of non-conjugated pendant chains on the supramolecular self-assembly and solid-state emission properties in naphthalimide luminogens. This chapter also includes the detection and unfolding of multifunctional nonheme protein ferritin under physiological conditions using the fluorescent nanoassembly based on naphthalimides. *Chapter 3* provides a conceptual insight on the functional group assisted fine-tuning of supramolecular self-assembly and condensed state luminescence in naphthalimides. *Chapter 4* demonstrates the formyl group driven ultra-detection of hydrazine on multiple platforms. *Chapter 5* demonstrates the spontaneous formation of long alkyl chain incited fluorescent naphthalimide nanosheets for sensitive detection of organic volatile contaminants in water via acceptor excited photoinduced electron transfer (a-PET) mechanism.

Overall, development of new strategies to generate and systematically tune the condensed state emission and supramolecular self-assembly properties in traditional fluorophores have been reported. Besides, the spontaneously formed fluorescent supramolecules were used to detect biologically active and environmentally active analytes in aqueous media.