



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

This thesis explores the structural optimization and functional versatility of Naphthalimide (**NI**) and Perylenimide (**PI**) luminogens, focusing on their condensed state emission properties and supramolecular self-assembly behaviors. Traditional fluorophores like **NI** and **PI** often suffer from aggregation-caused quenching (ACQ) in their aggregated state, limiting their practical applications. Through strategic structural modifications, such as extending π -conjugation and introducing flexible molecular designs, these molecules exhibit aggregation-induced emission (AIE), transforming them into robust emitters in condensed states. The thesis highlights applications in sensing and biomedical fields, emphasizing their role as fluorescent nano-aggregates for detecting toxic analytes and as photosensitizers for photodynamic therapy (PDT). By manipulating intermolecular interactions and molecular conformation, this work establishes a framework for enhancing the performance and expanding the applications of small molecule fluorophores in diverse technological domains.