INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	BISWA MOHAN PRUSTY
Roll Number	:	206122017
Programme of Study	:	Ph.D.

Thesis Title: Development of Stimuli-Responsive Suprasomes for Therapeutics, Temporal Catalysis and Communication

Name of Thesis Supervisor(s)	:	Prof. Debasis Manna
Thesis Submitted to the Academic Division	:	Chemistry
Date of completion of Thesis Viva-Voce Exam	:	31.12.2025
Key words for description of Thesis Work	:	Suprasome, Therapeutics delivery, Temporal catalysis, Intervesicle communication, Stimuli-responsive

SHORT ABSTRACT

This thesis focuses on the design and functional exploration of suprasomes, supramolecular assemblies formed through non covalent host guest interactions, and their applications in biomimetic and stimuli responsive systems. Beginning with fundamental aspects of supramolecular host guest chemistry, the work demonstrates the development of beta cyclodextrin based suprasomes for Zn^{2+} triggered antibiotic delivery with tunable antibacterial activity. The thesis further addresses a key challenge in therapeutic ion transport by designing supramolecular ion channel systems responsive to divalent metal ions such as Zn^{2+}. Going ahead, Zn^{2+} induced suprasomal transformation into transient supracubes is explored, enabling catalytic esterase activity and chemical communication between vesicular systems. Finally, a nature inspired, temporally gated, multistimuli responsive suprasome is presented, capable of photonic memory storage and inter vesicle communication. Collectively, this work establishes suprasomes as versatile platforms for drug delivery, controlled catalysis, information processing, and communication in synthetic systems.