INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
PhD-17 SHORT ABSTRACT OF THESIS

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Thesis Title: **Design and Development of Stereoselective Methods for *C*-, *O*-, and *S*-Glycoside Synthesis Utilizing Sterically Strained Nitrogen Bases and Cyclic Sulfonium Salts**

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Key words for description of Thesis Work	:	Stereoselective glycosylation, sterically strained pyridinium salts, sulfonium-stabilized phenols, proton sponge (DMAN), organocatalysis, Pd-catalyzed glycosylation, hydrogen bonding networks, ion-pair interactions, concerted addition, through-space stabilization effects, synthetic versatility and scalability.

SHORT ABSTRACT

The thesis focuses on the design and development of stereoselective methodologies for *C*-, *O*-, and *S*-glycoside synthesis, employing sterically strained nitrogen bases and cyclic sulfonium salts. Glycosylation, a cornerstone of carbohydrate chemistry, demands precise control over regio- and stereoselectivity, and this work introduces innovative catalytic strategies to address these challenges. The thesis introduces organocatalytic methods that exploit sterically strained pyridinium salts to achieve highly selective N-O-linked glycosides and establishes sulfonium-stabilized phenols as hydrogen-bonding catalysts for the strain-release glycosylation of cyclopropanated sugars, enabling access to septanoside frameworks. A palladium-catalyzed approach is also demonstrated, where proton sponge plays a unique triple role as a reductant, ligand, and base, furnishing biologically significant aryl *C*-glycosides with excellent yields and selectivity. In addition, new sterically hindered pyridine derivatives are synthesized and evaluated to understand the interplay of sterics, inductive, and through-space effects on basicity and reactivity, offering cost-effective alternatives to established non-nucleophilic bases. Collectively, these studies provide novel catalytic concepts, mechanistic insights, and practical synthetic applications, advancing stereoselective glycosylation and expanding the toolkit for carbohydrate chemistry and related fields.