INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : **Ph.D.**

Thesis Title: **Expeditious Thermal(Photo) Induced Functionalization/Annulation: *En route* to N-Heterocycles**

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SHORT ABSTRACT

The content of the thesis has been divided into four chapters. The thesis streamlines the synthesis of aromatic and non-aromatic N-heterocycles. It contributes towards the facile formation of C–C, C–N, C–O and C–S bonds using *o*-alkynylanilines, maleimides, 2-aryl quinoxalines, (benz)imidazoles, boronic acids and disulfides. ***Chapter I*** introduces transition metal induced (thermal) and photochemical construction of C–C and C–Heteroatom bonds. The mechanism involved in both transition metal induced (thermal) and photochemical approach are discussed. Both the processes are explained in details with the help of suitable examples. ***Chapter II*** describes a Cu(I) mediated cascade cyclization/annulation of unprotected *o*-alkynylanilines with maleimides in one-pot. The protocol offers sequential formation of one C–N and two C–C bonds to deliver fused benzo[*a*]carbazoles having free NH skeletons. The annulated products have been exploited towards various applications. ***Chapter III*** describes a $Cu(OTf)_2$ mediated regioselective de-aromatized aryl-hydroxylation across $C(sp^2)$=N bond of 2-aryl quinoxalines and bis-N-arylation of (benz)imidazoles using aryl boronic acids. For dearomative aryl-hydroxylation, the C-center should be electrophilic (*ca.* 0.08), N-center nucleophilic (*ca.* –0.50), and the $C(sp^2)$=N bond should be polarized (Δe = 0.609). ***Chapter IV*** describes a visible light-driven di-functionalization of maleimide with disulfide and *in situ*-

generated singlet oxygen to offer selective 1,2-thiohydroxylation under additive-free conditions. Here, the disulfide plays dual role of photosensitizer and the coupling reagent.