



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title: “**Synthesis of Unnatural Amino Acids and Their Spectroscopic Applications**”

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SHORT ABSTRACT

The thesis contains a total of **5 Chapters** including one Introduction Chapter (**Chapter-1**). Each chapter contains their individual introduction, experimental and reference sections. In short, **Chapter-1** is a critical review of applications of UNAAs in genetic incorporation, site specific protein modification and fluorophoric unnatural amino acids in sensing. **Chapter-2** elaborates the synthesis of triazolyl, thiocyanyl, and isothiocyanyl unnatural amino acids *via* “click” chemistry, nucleophilic substitution reaction and *via* decomposition of dithiocarbamic acids salts respectively. Our design concept is focused on possible site specific incorporation of triazolyl amino acids, isothiocyanyl and thiocyanyl amino acids as a new class of side chain modified sulfur-containing amino acids. **Chapter-3** describes the application of isothiocyanyl alanine (^{NCS}**Ala**) in the synthesis of thioureayl alanines and then to aminotetrazolyl alanine as other new classes of unnatural amino acids. Our design concept exploited the electrophilicity of –NCS functionality. **Chapter-4** deals with isothiocyanyl alanine/lysine as solvatochromic IR responsive probes for possible probing of local structures and electrostatic microenvironment of a short peptide containing ^{NCS}**Ala**/^{NCS}**Lys** with the help of distinct infrared absorption property of –NCS functionality. The electrophilicity of ^{NCS}**Ala** and ^{NCS}**Lys** in a short tri-/hexa-peptides have further been exploited to label covalently with chromophoric/fluorophoric amine and detail conformational study has been carried out in order to monitor conformational changes. **Chapter-5** describes application of fluorescent pyrenylthioureyal alanine amino acid in sensing of Hg²⁺ and Cu²⁺ ions in semi aqueous medium.