



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : Rajat Subhra Giri

Roll Number : 146122015

Programme of Study : Ph.D.

Thesis Title: Investigation on Supramolecular Arrangement and On-Resin Modification of Small Peptides

Name of Thesis Supervisor(s) : Prof. Bhubaneswar Mandal

Thesis Submitted to the Department/ : Chemistry
Center

Date of completion of Thesis Viva-Voce Exam : 24.04.2020

Key words for description of Thesis Work : Secondary structure, nano-rod and nano-tube structure, self-assembly, morphology, β -sheet, single and double helix, side chain modification, L/L and D/L amino acids, peptides, peptidic resin, and peptide synthesis.

SHORT ABSTRACT

The thesis contributes a large scale of structural information, supramolecular self-assembly, conformation, and the morphology of various natural/unnatural amino acids containing peptides, both solid-state and solution. We demonstrated twisted β -sheet and cross β -sheet structure of the Alzheimer's $A\beta_{39-40}$ and $A\beta_{41-42}$; nano-rod and nano-tube like structure from alternating D/L amino acid-containing dipeptides. The nano-rods are found to more stable than nano-tubes due to their different packing mode obtained from the crystal structure. We described a novel 'open turn' structure and the role of side-chains on peptide backbone from small tripeptides. They self-assembled to build supramolecular herringbone helical structure in the crystalline state. We also demonstrated the self-assembly and conformational polymorphism of alternating D/L amino acid-containing tripeptides. They self-assembled to form a single and double helix-like structure in the crystalline state. A mild, cost-effective, eco-friendly Lewis acid $FeCl_3$ based method for the removal of tert-butyl group from the side-chain of Asp/Glu during the elongation of peptide on the acid-sensitive Rink amide resin has been demonstrated. Boc-chemistry is performed on acid-sensitive Fmoc resin by using $FeCl_3$ instead of corrosive TFA. Interestingly, both Fmoc and Boc chemistry is performed on the same resin.