Centre for Biosystems Science and Engineering
Seminar

Cross β Amyloid Nano structures: From Chemical Evolution to Functional Materials

22nd July 2016

4:00 PM, MMCR, Mechanical Engineering.

Dr. Dibyendu Das

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The remarkably diverse molecular assemblies, complex chemical approaches, and co-operative molecular systems that have emerged in living systems continue to inspire unique material development. The central tenet of this talk will be the fascinating overlap of self-assembled soft materials, nano materials and 2D materials with the worlds of biology.

The speaker will introduce how specific nucleating nicks (4-7 residues) of Aβ (1-42, a sequence best recognised in Alzheimer's disease) were assembled *in-vitro* to form polymorphically diverse yet homogenous cross β micro phases. These nano structures had distinct surface patterns in terms of exposed charged residues (Lysine, Histidines and so forth) with hydrophobic grooves (Leucine, Glutamate). This amphiphilic nature of the nano phases was exploited to bind protein to form a unique class of soft nano hybrids that showed striking activation in organic solvents, reaching up to 450 fold of native activity. Further, the amphiphilic nature of the micro phases was used to incorporate 2D layered dichalcogenides, which showed acute responsiveness towards NIR light.

The talk will also include a discussion on the discovery of a cross β hydrogel, which showed reversible gel to solution transition on exposure to 804nm laser. Finally the speaker will share the initial results of how these assemblies can act as surrogates for large extant polypeptide sequences in modern day enzymes and hence might have played a critical role in the context of chemical emergence of life.

About the speaker

Dibyendu Das is working as Assistant Professor of Chemistry Department at Indian Institute of Science Education and Research (IISER) Tirupati. He obtained his MSc degree in Chemistry at the University of Calcutta (India, 2005), PhD in Biological Chemistry at Indian Association for the Cultivation of Science, (India, Thesis 2010) and postdoctoral training at the Emory University (USA, 2010-2013). From 2013-2015 he was working as INSPIRE Faculty at Institute of Nano Science and Technology (INST), India. His research group is interested in the questions of chemical emergence of life and how minimalistic biosystems can create functional materials.