Abstract

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Thesis title: **SELF-ASSEMBLING PEPTIDE/AMINO ACID BASED FUNCTIONAL GELS AND COPPER NANOCLUSTERS: FROM FORMATION TO APPLICATION**

Submitted by: **Biplab Mondal**

Now a days, peptide based soft functional materials have drawn increasing attention due to their cheap process-ability and biocompatibility. A simple peptide based amphiphilic ambidextrous gelator molecule [Myristyl-L-tryptophan-L-phenyl alanine] has been designed and synthesized and this can form gel in both aqueous and organic solvents starting from n-hexane to aqueous buffer solution at pH 7.46. The gelator has been successfully utilized for the removal of toxic organic dyes, metal ions, and spilled oil from waste water. Moreover, this gelator molecule shows highly selectivity towards cationic organic dyes in presence of organic anionic dyes. A series of peptide amphiphiles containing L-phenyl alanine and L-tryptophan as residues have been studied for anti-bacterial and antiparasitic studies. The peptide amphiphiles with the amino acid L-phenyl alanine shows both anti-bacterial and anti-parasitic activity. Highly stable blue emitting copper nanoclusters (CuNCs) has been synthesised and found to be used as an active catalyst for $C(sp^2)$–$C(sp^2)$ and $C(sp^2)$–$N(sp^3)$ bond forming reaction. Moreover, a red emitting CuNCs was synthesised in gel medium and these clusters are found to be highly stable in gel medium as well as in solid state (xerogel state) form. This red emitting CuNCs hydrogel can be used as a potential fluorescent ink and the solid state material can be used as a fingerprinting material in future.

Biplab Mondal
Signature of the Candidate
Date: 30.01.2023

A. Banerjee
Signature of the Supervisor
Date: 30.01.2023

प्रो. अरिंदम बनर्जी / Prof. Arindam Banerjee
वरिष्ठ प्रध्यापक / Senior Professor
जैविक विज्ञान शाखा / School of Biological Sciences
इण्डियन एसोसियेशन फॉर द कल्टिवेशन ऑफ साईन्स
Indian Association for the Cultivation of Science
यादवपुर, कोलकाता - 700032 / Jadavpur, Kolkata - 700032, INDIA