REGIONAL CENTRE FOR BIOTECHNOLOGY
Seminar series

Responsive Peptide Hydrogels for Biotechnological Applications

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Biomolecules, such as peptides, are versatile building blocks for production of functional gels, which mimic certain properties of the biological system with minimal complexity. These gels may be ideally suited to interface the synthetic systems with biology, and as such they have attracted much interest in a range of areas, including health care, environmental protection and green energy related technologies. Our approach of combining biocatalysis and self-assembly provides a convenient means to access diverse gels from single precursors, with reduced defects. This is possible because the arrested dynamics observed in gel phase materials can be exploited to lock gelators into non-equilibrium self-assembled structures. As a result, variable supramolecularmaterials are generated with differential suparmolecular chirality, gel stiffness and nanofibre morphology. The system used in this study, focuses on the aromatic dipeptide building blocks capped with a methyl or phosphate ester. Their self-assembly is induced by esterase enzymes like, subtilisin or phosphatase etc. In this talk I will also discuss our recent progress in developing an understanding of the nucleation and growth mechanisms of the biocatalytic self-assembly. Emergent functionalities from such molecular systems include optical, electronic and mechanical properties that may find applications in adaptive soft materials in context of bionanotechnology. I will show how this biocatalytic self-assembly process can be exploited in the 'dynamic templating' to control size and shape of gold nanoparticles, giving rise to tunable spectroscopic properties. The talk will be concluded with our recent findings to show how these biomolecular gels with variable stiffness can be utilized towards controlling the stem cell differentiation.