TIFR Centre for Interdisciplinary Sciences
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Seminar

Hybrid Protein Nano-fibrils from Fundamentals to Material Applications

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Protein aggregation plays major role in many aspects ranging from food, material and health science. Globular proteins aggregate at low pH and their self-assembly causes the formation of amyloid like protein fibrils. We investigated snapshots of the fibrillation and aggregation kinetics of multi-stranded β-lactoglobulin amyloid protein fibrils by combining scattering (SANS, DLS, DDLS) as well as atomic force microscopy (AFM).

Here, I will emphasize a novel technology in which hybrid membranes made from β-lactoglobulin protein fibrils and porous carbon for the treatment of water contaminated with heavy metals, metal cyanides or radioactive substances. During filtration, the concentration of heavy metal ions drops by three to five orders of magnitude per passage and the process can be repeated numerous times. The protein fibrils in the composite membrane play the main role of sequestering heavy metal pollutants from the liquid. Importantly, these protein fibrils also allow the reduction of membrane-immobilized metal ions into valuable metal nanoparticles or thin films at elevated temperatures or via chemical routes, turning a global risk challenge into a unique opportunity.

These β-lactoglobulin fibrils act as building blocks to prepare hybrid inorganic nanomaterials through biomineralization process. Inorganic hybrid materials have extraordinary physical properties such as conductive, magnetic and optical properties, and can serve multiple functional applications, ranging from optoelectronics, food fortification and catalysis.

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4:00 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS