Protein Langmuir-Blodgett (LB) nanofilms with amyloid motifs: characterization and application

Eugenia PECHKOVA - *University of Genova*

Amyloids are protein-based biomaterials composed of fibrils with cross-□□cores. Previously only associated with degenerative diseases as Alzheimer's and Parkinson's, amyloids remain active and functional both in *vivo* and in *vitro* conditions, enabling a variety of applications in nanotechnology. With an increasing interest in amyloid nanomaterials, the development of methods allowing their immobilization, such as fabricating amyloid thin films, and their characterization have come to the forefront.

The Langmuir-Blodgett (LB) nanotechnique, used for both enzyme immobilization and crystallographic nanotemplates, results in rather stable 2D protein organization. The amyloid motif can be generated in LB protein multilayers immobilized on Si_3N_4 membranes by thermal annealing, which consists of incubating the nanofilm at 150°C and cooling it to room temperature. Nanoaggregates and filamentous spherulites based on nanofibrillar subunits with cross-□□amyloid patterns were observed in annealed LB multilayers and characterized by advanced techniques such as X-ray nanodiffraction and Cryo-electron microscopy in microbeam electron diffraction mode (microED).

Protein LB nanofilms with amyloid motifs can easily find application in terms of key enabling technologies, namely in innovative nanotechnological devices for biomedical applications. The development of a nanobiosensor that detects the aggregation of amyloid fibrils through optical or electrochemical routes can improve our understanding of amyloid fibrillation and open new avenues in the diagnosing and treatment of Alzheimer's and Parkinson's diseases.