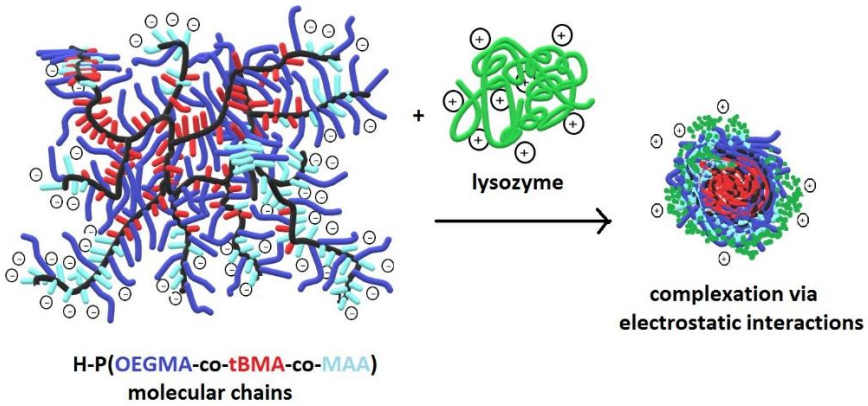
Novel synthetic copolymers for creating biohybrid nanostructures

A. Balafouti and S. Pispas*

Theoretical and Physical Chemistry Institute, National Hellenic Research Foundation, Athens 11635, Greece
pispas@eie.gr

The need for functional nanomaterials with advanced properties is increasing in modern society. Polymeric nanomaterials can contribute to several applications especially in the biomedical field. RAFT polymerization provides several types of intriguing polymer architectures, including branched synthetic macromolecules with diverse chemical functionalities and physicochemical properties. Designed chemical functionalities in conjunction with non-linear macromolecular topologies allow for finetuning interactions of synthetic polymers with biological species (protein, peptides, nucleic acids) and nanostructuration following biomimetic self-assembly schemes, through non-covalent interactions.

In this presentation the synthesis of amphiphilic, hyperbranched, charged copolymers through RAFT polymerization and post-polymerization modification schemes is presented. Furthermore, the electrostatic self-assembly of hyperbranched copolymers with proteins and peptides towards the creation of biohybrid nanostructures is discussed. Their structure and properties in aqueous media are elucidated using a gamut of advanced physicochemical techniques, including light scattering techniques and cryo-electron microscopy. Such nanoscopic structures are designed as functional nanocarriers/nanoconstructs for protein delivery, enzyme immobilization and for antimicrobial protocols related schemes.



Scheme 1: Schematic depicting the complexation of H-P(OEGMA-co-tBMA-co-MAA) hyperbranched copolymer with lysozyme.

References:
[1] A. Balafouti, S. Pispas, Materials 16 (2023) 1045.
[2] A. Balafouti, A. Forys, B. Trzebicka, A. Gerardos, S. Pispas, Materials 16 (2023) 7702.