

BIOMIMETIC POLYMERSOMES SELF-ASSEMBLIES AS ACTIVE FUNCTIONAL BIOMATERIALS

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We report here an overview on the self-assembly of amphiphilic block copolymers developed at LCPO into different nanomedicines, mainly focusing on polymer vesicles, also referred as polymersomes, and their applications in loading and controlled release of both hydrophilic and hydrophobic molecules and biomolecules.

We pay special attention to polysaccharide and polypeptide-based block copolymer vesicles and their development in nanomedicine.^[1-3] In this context, we developed over the last years synthetic strategies for the design of glycosylated polypeptides and polysaccharide-polypeptide biohybrids with controlled placement of sugar functionality. We were especially interested in designing amphiphilic copolymers able to self-assemble into well-defined micelles and vesicles that can advantageously be loaded with drugs and present a surface with multivalent presentation of bioactive saccharides or oligosaccharides. The ability of these nanoparticles for different biomedical applications, from drug-delivery to inhibitor, will be presented. We especially evidenced the particular benefit of nanoparticles and their multivalency toward the interaction with biological receptors.^[4-5] In order to get closer to the real structure of glycoproteins, we are now moving from synthetic to genetically engineered polypeptides, focusing on post-modification of elastin-like proteins.^[6-7]

Finally, our recent advances in using “biomimicry approaches” to design complex, compartmentalized and functional protocells will be proposed. Such a system constitutes a first step towards the challenge of structural cell mimicry and functionality, and may act in the future as an autonomous artificial cell that can sense and cure *in situ* any biological deregulation.^[8-12]

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