

## Biomimetic and biofunctional polymersomes: from nanomedicine to protocells

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We report here an overview on the self-assembly in water of amphiphilic block copolymers developed in our laboratory into different nanomedicines, mainly focusing on polymer vesicles, also referred as polymersomes, and their applications in nanomedicine, biomaterials and artificial cells.

We pay special attention to polysaccharide, polypeptide and protein-based block copolymer vesicles. 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.



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.