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Minisymposium
"Auto-assemblages et polymères"

Vendredi 21 juin 2024 9h30-11h30

Amphithéâtre Henri Benoît

Sébastien Lecommandoux

LCPO, Université de Bordeaux, France

Self-Assembly of Biohybrid Polymers: from Smart Therapeutics to Protocells

Matthieu Sollogoub

IPCM, Sorbonne Université, Paris, France

Control of cyclodextrin self-assembly and unidirectional movement

Christophe Chassenieux

IMMM, Université du Mans, France

Production and monitoring of the ageing of plastic microparticles in aqueous media

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Vendredi 21 juin 2024 9h30-11h30

Sébastien Lecommandoux (LCPO, Université de Bordeaux, France)

Self-Assembly of Biohybrid Polymers: from Smart Therapeutics to Protocells

We present here an overview of the self-assembly of amphiphilic block copolymers and their contribution in nanomedicine. We pay particular attention to block copolymer vesicles based on polysaccharides, polypeptides and proteins especially based on Elastin Like Polypeptides, aiming at mimicking both the structure and functionality of glycoproteins and lipoproteins. The ability of these systems for different biomedical applications, from bioprinting, drug-delivery to inhibitor, will be presented. Finally, our most recent advances in the design of complex, compartmentalized and functional artificial cells will be proposed. These systems represent a first step towards the challenge of structural and functional mimicry of cells, which in future could act autonomously to detect and repair any biological deregulation in situ.

Matthieu Sollogoub (IPCM, Sorbonne Université, Paris, France)

Control of cyclodextrin self-assembly and unidirectional movement

Cyclodextrins are cyclic oligosaccharides possessing a cavity able to include a guest. This property is used in our daily life, where cyclodextrins serve as deodorants, excipients or in chiral stationary phases. In these applications, cyclodextrins are unfunctionalized or randomly functionalized. More sophisticated applications require efficient functionalizations which were unavailable for a long time. Over the years, we delineated several strategies to efficiently and selectively access poly-hetero-functionalized cyclodextrins. The ability to place different functions anywhere on a cyclodextrin allowed us to induce and control their self-assembly. The addition of a second function on the cyclodextrin further produced well-defined architectures. Co-assemblies with DNA could also be made to form viro-like constructs. Inspired by the movement of kinesin, we have also exploited the conical shape of cyclodextrins to induce their unidirectional movement when it is threaded on a functional axle.

Christophe Chassenieux (IMMM, Université du Mans, France)

Production and monitoring of the ageing of plastic microparticles in aqueous media

The accumulation of plastic waste in the oceans is a global environmental challenge. Every year, between 8 and 15 tons of plastic waste enter the marine environment, and these quantities are set to increase in the coming years. Under the conditions of the aquatic environment, plastic waste undergoes a transformation due to UV radiation from the sun as well as mechanical abrasion of its surface by waves, currents and sand, possibly combined with the action of micro-organisms leading to fragmentation into small particles called secondary microplastics (MPs) when their size is less than 5 mm and nanoplastics (NPs) when their size becomes less than 1 µm. Microplastics are ubiquitous in the environment, even in the most remote areas. These particles have been found in all aquatic compartments (surface, water column, seabed sediments) in all the world's seas and oceans, as well as in 80% of the world's tap water systems. At IMMM, we have implemented techniques for producing plastic microparticles whose characteristics are as close as possible to those of particles taken from the environment, the main disadvantage of the latter being that they are usually obtained in quantities too small for representative ecotoxicological studies. We then monitor their degradation during accelerated ageing in climatic chambers in order to establish the ultimate fate of the plastics thanks to scattering and confocal microscopy experiments.

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