Communication ☒ Oral
☐ Poster

Fluorescent functional polypeptide nanoparticles

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Polypeptide-based nanoparticles have a wide range of applications, such as drug delivery, biosensing and bioimaging, due to their inherent biocompatibility and biodegradability.[1] These nanoparticles are typically synthesized from amphiphilic copolymers via the ring-opening polymerization (ROP) of *N*-carboxyanhydrides (NCAs) in organic solvents, followed by nanoprecipitation in water.[2]

A more promising approach involves the use of Polymerization Induced by Self-Assembly (PISA) combined with ROP of NCAs (ROPISA).[3] In this process, a NH_2-terminal solvophilic polymer initiates the polymerization of a solvophobic NCA monomer to afford nanomaterials in one pot and at high solid content: while the polypeptide chain extends, the copolymer becomes amphiphilic and self-assembles as nanoparticles. Recently, our team described the first example of aqueous ROPISA[4,5] of NCA monomers (ɣ-benzyl-L-glutamate, L-leucine) using various macroinitiators including poly(ethylene glycol), poly(proline), polysarcosine or recombinant proteins. The resulting rod-shaped nanoparticles (~ 100 nm length) consist of a hydrophilic shell and a hydrophobic polypeptide core.

In this talk, I will provide a comprehensive overview of recent progress in the synthesis of fully peptidic core-shell nanoparticles via ROPISA. This method allows the use of hydrophilic NH_2-polyelectrolytes as initiators and the incorporation of reactive NCA monomers to create functional hydrophobic cores. These particles can be further functionalized with biomacromolecules, such as oligonucleotides, and the introduction of fluorescence into the core. The outcome of this research is the creation of advanced biodegradable nanoparticles with significant potential for use in biomedical applications.

References

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Fundings

This project has received funding from the European Research Council (ERC) under European Union’s Horizon Europe research and innovation program (Grant agreement N° 101077364). CG and AEJH acknowledge the support from the university of Bordeaux, Bordeaux-INP, CNRS and the LIGHTS&T Graduate Program (PIA 3 Investment for Future Program, ANR-17-EURE-0027)