

Synthesis of antibacterial and thermoresponsive polymers used as coatings for the release of a healing agent on chronic wounds

Ph.D. position at the Institut Charles Sadron, Strasbourg (France) starting on September 1, 2023

The World Health Organization continues to alert the health sector to the emergence and proliferation of multi-resistant microbial strains to antibiotics. In Europe, one in twenty patients will contract a nosocomial infection during their hospitalization, representing the sixth leading cause of death in hospitals. As an alternative to the administration of antibiotics, strategies to control nosocomial infections must be implemented involving the discovery of new antimicrobial agents and the use of adapted modes of administration.

We have synthesized poly(methacrylate-*g*-oligoarginine)s which exhibit an unexpected upper critical solution temperature (UCST) behavior, *i.e.* transition from insoluble to soluble upon increasing the temperature (**Figure 1**). This phenomenon is totally reversible allowing the formation of 200 nm aggregates at room temperature, that are able to encapsulate bioactive molecules, and their dissolution at 37 °C or above (*Eur. Polym. J.* **2020**, *125*, 109528). Moreover, the decaarginine-based macromolecules showed antibacterial properties against *Staphylococcus aureus* (*S. aureus*), one of the most virulent bacteria.

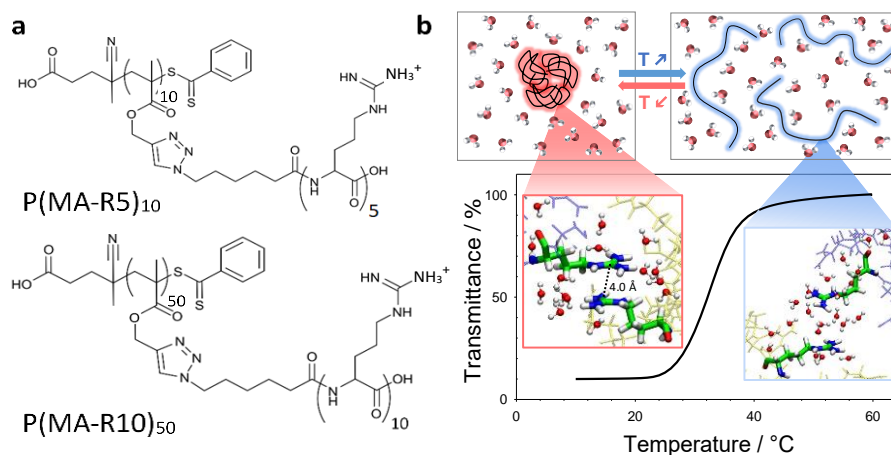


Figure 1: (a) Structures of poly(methacrylate-*g*-oligoarginine) with 5 and 10 arginine residues, (b) UCST property of the polymer in water due to the stacking of guanidinium groups from the arginine at room temperature, simulated by molecular dynamics.

The objective of the doctoral work is to (i) synthesize antibacterial and thermoresponsive decaarginine-based polymers of different topologies and (ii) to evaluate their biocompatibility in contact with human cells and their antibacterial properties in collaboration with INSERM UMR 1121 (Strasbourg).

The candidate should hold a Master degree or equivalent (or should be holding it by September 1, 2023) with a profile in molecular chemistry (organic synthesis, purification, and characterization of organic compounds) interesting in strengthening his/her skills in polymer chemistry and in working on a project at the interface of chemistry and biology. A previous experience in peptide synthesis, polymer synthesis or physical chemistry of polymers would be appreciated. No skills in biology are requested.

If interested, please submit your application that should include your curriculum vitae, a cover letter describing your interest for this project, your transcripts of your Master degree, and the name and email address of two persons that could be contacted to the offer UPR22-DELCHA-005 on the website of CNRS emploi (<https://emploi.cnrs.fr/>).