

Description

The design of polymers is of importance for applications in biomedicine such as tissue engineering and drug delivery.¹ For the treatment of cancer, polymers are designed to enhance the half-life of the anticancer drug to accumulate it at tumor sites without damaging healthy cells. Various strategies have been developed including the use of polymers that are responsive to either an endogenous or exogenous stimulus. Thermoresponsive polymers have gain attention in this field due to their ability to respond to temperature leading to a sharp change in properties.² The two main types of thermoresponsive polymers are those exhibiting a lower critical solution temperature (LCST) with a change from soluble to insoluble upon increasing the temperature, *e.g.* poly(*N*-isopropylacrylamide), and those presenting an upper critical solution temperature (UCST) having the opposite behavior, *e.g.* poly(acrylamide-*co*-acrylonitrile). Recently, our team has synthesized and investigated a comb polymer with pentaarginine pendent grafts exhibiting an UCST behavior (Fig. 1).³ This behavior was attributed to the stacking of the guanidinium groups. The doctoral project will focus on the synthesis of comb polymers with different amino acids and the investigation of their thermoresponsive behavior, but also the encapsulation and release of an anticancer drug within the polymer in its collapsed state.

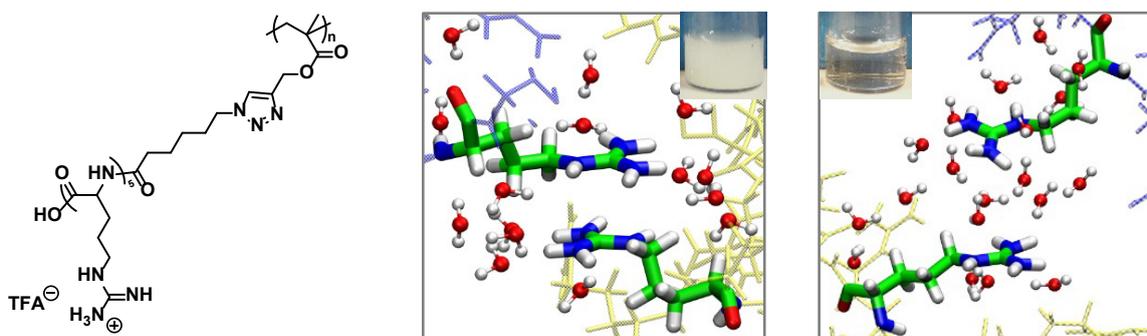


Fig. 1. Structure of the comb polymer with pentaarginine grafts and molecular dynamics highlighting the stacking of the guanidinium groups.

References

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2. a) M. A. Ward, T. K. Georgiou *Polymers* **2011**, *3*, 1215-1242; b) A. Bordat, T. Boissenot, J. Nicolas and N. Tsapis, *Adv. Drug Deliv. Rev.*, 2019, **138**, 167-192.
3. a) N. Zydziak, M. H. Iqbal, A. Chaumont, A. Combes, E. Wasielewski, M. Legros, L. Jierry, P. Lavalley, F. Boulmedais, D. Chan-Seng *Eur. Polym. J.*, **2020**, *125*, 109528; b) A. Augé, T. Dorosh, A. Rachdi, Q. Bievelot, A. Chaumont, F. Boulmedais, D. Chan-Seng *Eur. Polym. J.* **2025**, *238*, 114202

Requirements & Application

We are looking for a motivated Master student with a strong background in molecular chemistry interested in working on an interdisciplinary project at the interface of chemistry and biology. The candidate should have skill in organic chemistry, characterization, and purification of organic compounds.

The doctoral contract will be awarded by the doctoral school through a competition that will take place beginning of June. To apply to this doctoral project, please submit a cover letter, a curriculum vitae, the transcripts of your Master degree, and the contact information of at least two persons that could be contacted as references to Delphine Chan-Seng (delphine.chan-seng@ics-cnrs.unistra.fr). The cover letter should address your interest for this project and the skills you have already acquired that could be beneficial to this work.