



**SORBONNE
UNIVERSITÉ**

CHINA SCHOLARSHIP COUNCIL

Appel à projets

Campagne 2022

<https://www.sorbonne-universite.fr>

Title of the research project :

Templated Polymerization-Induced Self-Assembly (PISA), a sustainable method to produce polymeric nanofibers

Thesis supervisor (HDR) :

Name : RIEGER

Surname : Jutta

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Research Unit

Name : Parisian Institut of Molecular Chemistry (IPCM)

Code (ex. UMR xxxx) : UMR8232

Doctorate School

Thesis supervisor's doctorate school (candidate's futur

doctoral school) : ED 397 Physique et Chimie des Matériaux

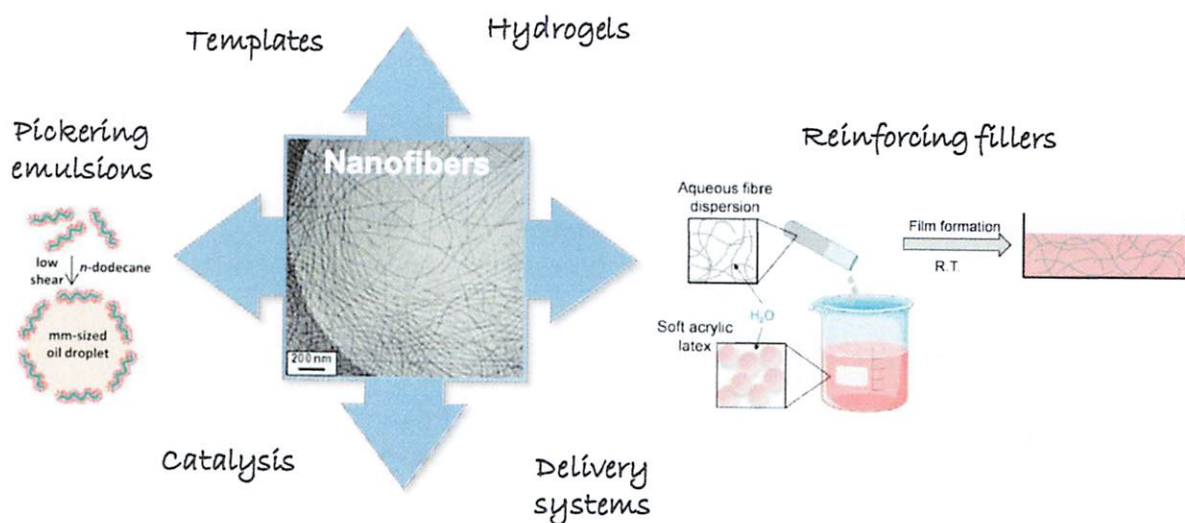
PhD student currently supervised by the thesis supervisor (number, year of the first inscription) :

In 2022: 1 PhD student (first inscription in 2020)

Description of the research project (*ENGLISH*):

1) Context

Polymeric nanofibers are particularly interesting structures since they can be used for numerous applications: as stabilizers for Pickering emulsions,[1] as reinforcing fillers for water-based coatings,[2] or for biomedical applications and catalysis (see figure below) to name some of them. However, despite the development of various preparation methods for nanofibers, their synthesis remains challenging.



2) Details of the proposal

In our group, we have recently devised a novel straightforward and eco-responsive technology that allows preparing polymeric nanofibers at high concentrations, directly in water.[3] The developed technology[3,4] is based on the combination of a controlled/living polymerization technique (using notably the reversible addition fragmentation chain transfer technique = RAFT), a straightforward self-assembling strategy (polymerization-induced self-assembly = PISA[5,6]), and a supramolecular sticker, that promotes 1D-assembly leading to the formation of filamentous structures. In our previous work, we have validated the proposed concept using a supramolecular bisurea sticker.[3]

In this project, we aim at extending this concept to other materials and stickers in order to synthesize a library of nanofiber-based materials directly in water, in robust synthetic conditions. Depending on the polymer properties, different applications of the nanofibers will be explored.

3) Key words

Reversible deactivation radical polymerization (RDRP) - RAFT polymerization - supramolecular chemistry - block copolymer self-assembly – nanofibers - SAXS

4) References

- [1] "Vermicious thermo-responsive Pickering emulsifiers." K. L. Thompson, L. A. Fielding, O. O. Mykhaylyk, J. A. Lane, M. J. Derry, S. P. Armes*, Chem. Sci. **2015**, 6, 4207.
- [2] "Water-based acrylic coatings reinforced by PISA-derived fibres." R. Albigès, P. Klein, S. Roi, F. Stoffelbach, C. Creton, L. Bouteiller, J. Rieger*, **Polym. Chem.** **2017**, 8, 4992.
- [3] "Templated-PISA: Driving Polymerization-Induced Self-Assembly towards the Fibre Morphology." G. Mellot, J.-M. Guigner, L. Bouteiller, F. Stoffelbach*, J. Rieger*, **Angew. Chem.** **2019**, 58, 3173.
- [4] "Bisurea-functionalized RAFT agent: a straightforward and versatile tool towards the preparation of supramolecular cylindrical nanostructures in water." G. Mellot, J.-M. Guigner, J. Jestin, L. Bouteiller, F. Stoffelbach*, J. Rieger*, **Macromolecules** **2018**, 51 (24), 10214.
- [5] "Guidelines for the synthesis of block copolymer particles of various morphologies by RAFT dispersion polymerization." J. Rieger*, **Macromol. Rapid Commun.** **2015**, 36, 1458.
- [6] "RAFT-mediated polymerization-induced self-assembly." F. D'Agosto*, J. Rieger*, M. Lansalot*, **Angew. Chem.** **2020**, 59 (22), 8368-8392.

5) Profile of the Applicant (skills/diploma...)

We are looking for a highly motivated candidate with practical experience in organic chemistry and/or polymer synthesis. Experience in studying the physical-chemical properties of block copolymer assemblies would be a plus. Good communication skills in English and good teamwork skills are mandatory.

Contacts:

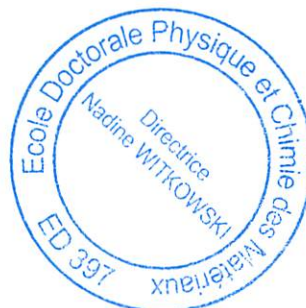
Thesis supervisor

Dr. Jutta Rieger

Email address of the thesis supervisor: jutta.rieger@sorbonne-universite.fr

Applications including a complete CV, a motivation letter and two references must be send before January 15th, 2022.

avis favorable



Ecole Doctorale 397

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