

DC6: Antibacterial using Ugi Multicomponent reaction for Particles and Innovative Materials with Polypeptoid

Host institution: CNRS Institut de Chimie et des Matériaux Paris-Est (CNRS-ICMPE), Paris, France

Supervisor: [Prof. Benoit Couturaud](#)

Co-supervisors: Prof. B. Carbonnier (CNRS-ICMPE), Prof. B. Le Droumaguet (CNRS-ICMPE), Prof. Marco Monopoli (Royal College of Surgeons in Ireland)

Project description: Persistent wound infections are increasingly difficult to treat due to antimicrobial resistance and the protective nature of bacterial biofilms, which limit the effectiveness of conventional therapies. Current antimicrobial materials often suffer from limited stability, poor biocompatibility, or insufficient efficacy against complex biofilm environments.

This PhD project focuses on the development of innovative antimicrobial materials based on polypeptoids, a class of synthetic polymers that mimic natural peptides while offering enhanced stability and tunability. In particular, the project will explore the synthesis of polypeptoid-based nanoparticles using multicomponent reactions and polymerisation-induced self-assembly, alongside the design of biohybrid hydrogels.

A key objective is to create multifunctional antimicrobial systems that integrate structural versatility with biological activity. This includes the development of polypeptoid particles with controlled properties, as well as hydrogel platforms capable of delivering antimicrobial agents and interacting effectively with biofilm matrices. The project will also investigate structure–property relationships and the interaction of these materials with biological environments.

The doctoral candidate will be trained in advanced polymer chemistry, self-assembly processes, and the design of functional biomaterials, as well as in antimicrobial evaluation within relevant biological models. The outcomes will contribute to the development of next-generation antimicrobial materials within the broader HEAL-4WARD programme.

The degree-awarding institution is the University of Paris Est-Créteil.

Host laboratory: The doctoral candidate will be hosted within the Molecular Chemistry and Macromolecular Materials (C3M) department at CNRS-ICMPE, a multidisciplinary research environment addressing key societal challenges in health, sustainability, and the environment. The department brings together expertise in organic chemistry, polymer chemistry, and soft matter physics to develop innovative functional materials.

Research activities focus on the synthesis of (bio)organic molecules using green chemistry approaches, the design of functional polymers with controlled architectures, and the chemical modification of bio-based and bio-inspired macromolecules. Particular emphasis is placed on self-assembly processes, nanostructuring of materials, and the development of biomaterials and multifunctional polymer systems.

Secondments: This project is carried out in collaboration with the following groups, and visits to their laboratories are expected during the project. A willingness to travel and spend time abroad is therefore essential:

- [Prof. Marco Monopoli](#), Royal College of Surgeons in Ireland, Dublin, Ireland
- [Prof. Maurizio Prato](#), Centro de Investigación Cooperativa en Biomateriales CIC (biomaGUNE), Donostia-San Sebastián, Spain

Eligibility conditions:

- Master's degree in Chemistry, Polymer Chemistry, Materials Science, Chemical Engineering or related fields.
- Applicants must be doctoral candidates, i.e. not already in possession of a doctoral degree.
- Mobility rule: researchers must not have resided or carried out their main activity in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their recruitment date.



Required skills:

- Experience in polymer chemistry or organic synthesis (e.g. multicomponent reactions, polymerisation techniques), ideally demonstrated through Master's thesis work or research internships.
- Familiarity with nanoparticle synthesis or self-assembly processes and physicochemical characterisation techniques (e.g. DLS, TEM, SEC, spectroscopy) would be beneficial.
- Prior exposure to biomaterials or antimicrobial materials research is an advantage.
- Proficiency in the English language is required, as well as good communication skills, both oral and written. Successful candidates will need to provide an English test (e.g. IELTS, TOEFL, Cambridge English). You may be exempt if you are a national of a majority native-English speaking country, or have qualifications / degree that has been taught and assessed in English. The supervisor may also confirm that a candidate has the required level of English.

Remuneration:

The Doctoral Candidate will receive a gross monthly salary of EUR 4003.34 in accordance with the MSCA Doctoral Networks programme, including a living allowance, a mobility allowance and a family allowance (if applicable). This amount corresponds to the contractual gross salary and is indicated before deduction of employee taxes and social security contributions. The net salary will depend on local taxation, social security and employment regulations.

Enquiries:

For general information about the HEAL-4WARD Doctoral Network visit the project website (www.heal4ward.eu) or send an email to heal4ward@gmail.com. For additional information on this project please contact Prof. Benoit Couturaud (benoit.couturaud@cnr.fr).

How to apply

- Apply directly at the host institution website: emploi.cnr.fr/Offres/Doctorant/UMR7182-BENCOU-003/Default.aspx
- Apply via Eraxess: euraxess.ec.europa.eu/jobs/429817

Required documents:

- Statement of interest (limit of 2,500 characters) explaining why you wish to be considered for the fellowship and which qualities and experience you will bring to the role.
- Curriculum vitae et studiorum.
- A certificate of University examinations taken (with marks).
- A final degree certificate translated in English. If, at the time of application, candidates should not be yet in possession of a degree certificate, they can submit it at the time of the examination.

A limited number of applicants will be invited for an interview and will be required to provide contact information of up to two contact person for reference letters.

Application deadline: The closing date for applications is **18 May 2026**.