

DC4: 3D-printing of microneedle patches from synthetic swellable and fast degrading polymers for on-demand wound healing

Host institution: University of Nottingham, Nottingham, United Kingdom

Supervisor: [Dr. Vincenzo Taresco](#)

Co-supervisors: Robert Owen (University of Nottingham); Geoffrey Rivers (University of Nottingham); Prof. Benoit Couturaud (CNRS-ICMPE)

Project description: Advanced wound care requires therapeutic systems that can be tailored to individual patients while enabling precise and controlled drug delivery. Despite recent progress in additive manufacturing, the development of suitable polymeric materials for 3D-printed biomedical devices remains limited, particularly in terms of degradability, functionality, and integration with active nanomaterials.

This PhD project focuses on the development of synthetic swellable and fast-degrading polymers for the fabrication of microneedle patches using advanced 3D-printing technologies. The project will explore the synthesis of novel polymeric materials and their formulation into printable inks, followed by the optimisation of additive manufacturing techniques to produce high-resolution, multi-material microneedle devices. These systems will be designed to incorporate antimicrobial and theragnostic nanomaterials developed within the HEAL-4WARD network.

A key objective is to establish a versatile and customisable platform for microneedle fabrication that enables controlled drug release and adaptation to different wound types. The integration of degradable polymers with functional nanomaterials aims to enhance therapeutic efficacy while maintaining biocompatibility and sustainability.

The doctoral candidate will receive interdisciplinary training in polymer synthesis, materials formulation, and advanced 3D-printing technologies, as well as in the evaluation of biomedical devices. The project will contribute to the development of next-generation personalised wound care systems within the HEAL-4WARD programme.

Host laboratory: The current aim of the Taresco group is to create a range of polymers with flexible and tuneable properties that can dramatically improve the drug delivery, tissue engineering and additive manufacturing fields. Most importantly, this suite of polymers will be built on renewable and degradable materials and will largely be fabricated using natural enzymatic catalysts. These functionalised polymeric nano-delivery devices will be able to encode the optimum drug encapsulation as well as the greatest therapeutic efficacy and, thus, it will provide a step change in available formulation strategies. In addition, these new polymeric platforms will address the lack of novel and sustainable materials needed in the production of the next generation of additive manufacturing devices, drug delivery carriers and in the biofabrication field.

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. Benoit Couturaud](#), CNRS-ICMPE, Paris, France
- [Prof. Gustavo Bodelon](#), University of Vigo, Vigo, Spain
- [Dr. Natalia Baranova](#), Centro de Investigación Cooperativa en Biomateriales CIC (biomaGUNE), Donostia-San Sebastián, Spain

Eligibility conditions:

- Master's degree in 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 organic synthesis and polymer synthesis or biomaterials modifications/ development (e.g. degradable polymers or hydrogels) would be an advantage, ideally through Master's thesis or research projects.
- Familiarity with additive manufacturing or 3D-printing techniques and basic understanding of structure–property relationships in polymer systems would be an advantage.
- Proficiency in English is required, together with good communication skills, both oral and written. Applicants must meet the English language **requirements of the host institution**. For the University of Nottingham, accepted qualifications and equivalencies, as well as potential reasons for exemption from these requirements are available at: <https://www.nottingham.ac.uk/studywithus/international-applicants/english-language/english-language-equivalencies.aspx>.

Remuneration:

The Doctoral Candidate will receive a gross yearly salary of ~EUR 48,592 in accordance with the MSCA Doctoral Networks programme, including a living allowance and a mobility allowance. This amount corresponds to the contractual gross salary and is indicated before deduction of employee taxes and social security contributions. An additional family allowance (if applicable) is foreseen. The net salary will depend on local taxation, social security and employment regulations. The EUR equivalent salary will vary due to fluctuations in the EUR/GBP conversion rate during the programme

Enquiries:

For general information about the HEAL-4WARD Doctoral Network visit the project website (www.heal-4ward.eu) or send an email to heal4ward@gmail.com. For additional information on this project please contact Dr. Vincenzo Taresco (vincenzo.taresco@nottingham.ac.uk).

How to apply

To learn more about the application process, visit the HEAL-4WARD recruitment web page (www.heal-4ward.eu/open-positions).

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 **30 June 2026**.