Part I: General introduction

In the last decade, lightweight fibre-reinforced composites have allowed the sustainable development of modern society by, for example, enabling more efficient wind turbines and making our vehicles lighter. Unfortunately, these materials are challenging to recycle: most composite parts are still incinerated or landfilled, two very polluting practices.

The FibReLoop project is a Marie Sklodowska-Curie (MSCA) Doctoral Network that aims to promote the industrial implementation of circular economy strategies for composites. Fourteen doctoral candidates will be trained to tackle the recycling of a composite part all the way to the design and production of new recycled components. The topics include the evaluation, enhancement, and development of current and new recycling technologies; the experimental assessment of the behaviour of the recycled materials; the development of material models and design approaches for recycled composites and parts; and the implementation of recycled composites and circular economic practices into real-life industrial cases. FibReLoop involves 18 European universities and companies.

Applications are invited for fourteen Ph.D. positions in the field of recycling of composites, leading to the award of a Ph.D. degree. The recruited researchers will be trained for 3 years to become interdisciplinary and multi-talented experts. They will develop advanced simulation tools to predict optimal microstructures for recycled composites, manufacture these microstructures and then verify them in industrial applications. The researchers will have a unique opportunity to be trained by world-leading experts in cutting-edge technologies, supported by a strong network and extensive industry participation.

Please note that some of the positions are hosted by an industrial partner. In this case, the researcher will also be enrolled in a Ph.D. program at a university.

Part II: Detailed description of individual positions

Title of the position: High-performance and throughput microwave-assisted technologies for fibre-reinforced composite recycling

Host organization (country): Politecnico di Milano (Italy)

Duration: 3 years

Description

The key challenge of this Ph.D. project is to design, experimentally implement and optimize efficient recycling processes for fibre-reinforced composites based on microwave-assisted technologies, and to validate such processes through the investigation of the characteristics (e.g., quality, yield) of the reclaimed fibres and matrix. The activities will be performed at the Department of Chemistry, Materials and Chemical Engineering “Giulio Natta” of the Politecnico di Milano (Italy) under the supervision of Prof. Stefano Turri and Prof. Gianmarco Griffini.

The work requires a strong theoretical and experimental background in polymer-based composite materials and composite recycling processes, together with a mindset for personal development. This project will mainly consist of experimental activities supported by solid process design and detailed analytical interpretation of the achieved results. During the appointment, two secondments are planned at two FibReLoop Consortium partners (one academic institution, one company).

During this Ph.D. project, the doctoral candidate will:

- design and implement efficient microwave-assisted processes for fibre-reinforced polymer composite recycling;
- optimize the developed recycling processes through appropriate parametric studies to promote future industrialization;
- investigate suitable pretreatment strategies on fibre-reinforced composites to maximize recycling process efficiency and throughput, and to ensure retention of material properties;
- characterize the performance of the developed recycling processes and the quality of the recovered fibres and matrix residue;
- participate in the dedicated training programme organised within FibReLoop (including technical, communication, career management and business skills) and in six-monthly project meetings;
- write scientific papers for publication in top-level journals in materials science and engineering;
- present his/her research in project meetings, international conferences and outreach events;
- work in close collaboration with supervisors while being the driving force for his/her own Ph.D.

Expectations and requirements

The ideal candidate is an enthusiastic and self-motivated person with a mindset for personal development. The applicant should meet the requirements for Ph.D. enrolment at Politecnico di Milano (please refer to: https://www.dottorato.polimi.it/en/prospective-phd-candidates/before-applying). Applicants have obtained (or are about to obtain) a M.Sc. degree with distinction in Materials Engineering, Chemical Engineering, Materials Science, Process Engineering or similar. Eligible applications will be assessed based on the applicant's (1) academic qualifications, (2) previous (documented) experience in fibre-reinforced composites materials preparation, characterization and recycling, (3) technical skills, (4) communication skills, and (5) motivation for the project. Politecnico di Milano has an equal opportunities and diversity policy, and we welcome applications from candidates with diverse backgrounds.

The post is supported by an allowance provided by the European Commission. The EU Researcher Allowances will be used to cover both the employee's and the employer's mandatory charges. The fellows are assigned full-time with a Ph.D. scholarship with full social security.

Candidates must fulfil the following minimum eligibility criteria:

1. They do not hold a Ph.D. degree at the start of their assignment at Politecnico di Milano.
2. They have not resided or carried out their main activity (work, studies, etc.) in Italy for more than 12 months in the 36 months immediately before their date of recruitment.

This means that the applicants' nationality is not relevant for their eligibility.

Procedure

Please send your detailed resumé and cover letter by email to gianmarco.griffini@polimi.it, using the following email subject: "[FIBERLOOP] DC2 application". The cover letter should clearly state which FibReLoop position you are applying for, as it is possible to apply for more than one. We kindly ask you not to include a photograph in your CV or cover letter. We are committed to equal opportunities, and removing these details will help us to evaluate people on their skills and experience, excluding potential unconscious biases.

Based on the resumé and cover letter, we will contact a short-list of applicants and will ask them to perform a technical task. Those successfully completing this task within the given time (normally two

weeks) will be invited to an online interview. The interview will consist of three parts and will last for about 1 hour in total:

1. You will present the completed task and your adopted approach.
2. You will present a paper relevant to the Ph.D. topic, and assess its strengths and weaknesses.
3. We will ask for clarifications about your background and gauge your motivation and skills.

For further details about this specific position or the procedure, please contact gianmarco.griffini@polimi.it. For general information on the Ph.D. programme at Politecnico di Milano, please visit: https://www.dottorato.polimi.it/en/prospective-phd-candidates.

Closing date: until filled.

Starting date: 1st of November 2024 at the earliest; 1st of February 2025 at the latest.