

DC11 Position

Project Title: Synthesis of polycarbonates and polyamides using reactive extrusion (REX)

Host Institutions:

- Main Host Institution - [AIMPLAS](#) - Spain (19 months)
- Secondary Host Institution - [CNRS](#) - France (15 months)

Project Description:

“To demonstrate the feasibility to produce polycarbonates and/or polyamides by using reactive extrusion (REX), which is considered a greener technology being a continuous process, which minimizes and even avoids the use of solvents and also reduces reaction times and overall energy consumption. Alternative monomers capable of being produced from CO₂ will be considered to produce those polycarbonates and/or polyamides.”

REx has significant value as it is a process that can be easily adapted to an industry infrastructure. The design of these synthetic approaches at AIMPLAS will be addressed considering a broad selection of process parameters and conditions such as residence time, temperature, screw configuration, catalyst type (commercial and developed in the project) in different concentrations and relative ratio of the monomers. The polymers developed will be broadly characterized to evaluate macromolecular, mechanical, thermal and rheological properties, thus, in particular molar mass, intrinsic viscosity, and so on, will be monitored.”

The studies will be started at lab scale in a Haake Minilab Extruder, which will be further evaluated at larger scale in a Brabender rheometer. Technical and economic feasibility has been evaluated in order to test higher scale in twin-screw extruders at pilot plants in AIMPLAS. Additionally, and along the technical viability evaluation of scaling-up, process simulations will be considered by using software such as Ludovic® and evaluating the screw designs.

Selected process towards polycarbonates and/or polyamides) will be optimized and obtained polymer material(s) will be characterized in-depth. Feasibilities studies will be carried out, including a state-of-the-art survey to identify a range of biopolymers grades that can be obtained by REX, and their potential applications as well as potential market sector.

Thus, bearing in mind capabilities and AIMPLAS expertise, a review of the obtained material(s) possibilities will be considered for extrusion, injection process, as well as compounding or suitability towards coating preparation. Technical viability of these possibilities will be discussed to identify needs for further developments. At CNRS, polymerization studies will focus on the design of novel CO₂-sourced polycarbonates and/or polyamides, through the synthesis by (co)-polymerization in solution or in bulk, and characterization of the polymers derived from diene-lactone platform molecules.

Secondment: the project involves a three-months research stay at [TOTAL Energies](#) facilities (Belgium) under the supervision of Dr. Martine Slawinski (the synthesized polymers will be tested in thermoplastic applications).



This project has received funding from the European Union (Marie Skłodowska-Curie Grant Agreement No 101073223)

Enrolment in Doctoral degree: DC11 will be enrolled in UPV (University Politècnica of València) and URennes (University of Rennes), obtaining two PhD titles, according to a specific agreement between the two universities.

Candidate Profile:

- Candidates should have an excellent academic record, strong commitment to scientific research and a solid working knowledge of English
- Solid and proven expertise in polymerization. A background in organic, organometallic chemistry and catalysis will be highly considered.
- Candidates must have a Master's or an equivalent degree in the area of Chemistry or related disciplines that must be completed by the time of admission in the PhD programmes (1st trimester 2024).

Eligibility criteria:

- Researchers must be doctoral candidates (not already in possession of a doctoral degree at the date of recruitment)
- Recruited researchers can be of any nationality and must comply with the following mobility rule: must not have resided or carried out his/her main activity (work, studies, et.) in the country of the **main** host institution for more than 12 months in the 36 months immediately before the recruitment date (1st trimester 2024)

Local eligibility criteria:

- For AIMPLAS: You must have a master's degree or at least 300 ECTS (of which at least 60 ECTS belong to the master's degree) or an equivalent degree which allows you to start a PhD
- For CNRS: You must have a master's degree in Chemistry

Employment conditions:

- Host institution (s)
 - AIMPLAS – Plastics Technology Centre (Spain)
 - Centre National de la Recherche Scientifique (CNRS) – Institut des Sciences Chimiques de Rennes (ISCR) – UMR CNRS 6226 - France
- Supervisor (s): Dr. Belén Monje & Prof. Sophie Guillaume
- Starting date: TBD
- Duration: 34 months, full-time employment
- Gross salary:
 - AIMPLAS: 33.700€/year (including mobility allowance)
 - CNRS: 36.560€/year (including mobility allowance)

How to apply:

Complete applications are written in English and include:

- A complete application [form](#)
- A letter of motivation (maximum 2 pages)



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- Diploma and academic record* of both the bachelor's and the master's degree. If not originally in English, an official translation could be requested.
- Contact details of two referees (Note that referees will be only contacted for short-listed candidates)
- Proof of English language proficiency

* The academic record must include the range of marks used in the corresponding countries and the minimum mark to pass, as well as the hours or ECTS and marks for each subject.

Application deadline: Open until filled

Selection process: The interviews will take place online

For more information: <https://dcarbonizeproject.eu/dc-positions/>

Contact person: Anna Banet (info@dcarbonizeproject.eu)