



1 – RECComBIOS PROJECT

Due to their performance, i.e. mechanical, and their lightness, biobased composites represent a promising alternative to technical composites based on glass fibers. These composites become therefore an essential link in the energy and environmental transition, due to their low carbon footprint which is more favorable than that of composites of petroleum-based origin. Biobased composites are nevertheless revolutionizing the way we develop materials, production tools and products. A new working paradigm must be created based on this eco-design of new products motivated by or for end of life. In this eco-design approach the suitability of materials for recycling is an integral part of the materials development phases. The recyclability of biobased composites is therefore naturally crucial and critical for the development of these materials.

The federative **RecComBioS « Recyclability of Biosourced Composites »** project, led by Carnot M.I.N.E.S, aims to assess the suitability for recycling of 100% biobased composites made of a biodegradable polymer matrix. This project gather several laboratories from Carnot M.I.N.E.S : IMT Mines Alès with C2MA ; Mines Paris PSL with CEMEF, CMAT & PERSEE ; IMT Mines Albi with ICA ; and Sigma Clermont with ICCF.

The objectives of the RecComBioS project are on the one hand to study the influence of the life cycle and recycling stages on the properties of biobased composites, with a particular emphasis on the evolution of the properties of fibers, matrix and the interface ; and on the other hand to propose strategies for regenerating the performance of these materials during recycling operations.

The two main challenges of the RecComBioS project will be to:

- understand the influence of the stages of the recyclability chain on the final properties of a 100% biobased composite with a biodegradable polymer matrix ;
- identify the critical steps during multiple cycles of reuse of the components of the composite.

2 – PROPOSED POSITION

As part of the RecComBioS project, CEMEF, ICA and CMAT are offering a 12-month post-doctorate position. Its mission will be to:

- analyze the influence of the physical and microstructural modifications generated by the aging and recycling of biobased composites on the crystallization of the matrix,
- evaluate the contribution of physico-chemical treatments of fibers on crystallization and the properties of composites.

This work will take place in several phases spread over the two research laboratory sites, and in collaboration with the other partners of the RecComBioS project. The successful candidate will be linked to the one hand to MSC/MaPP Team from ICA and on the other hand to PSP/BIO Team from CEMEF.

The position is based on Albi (IMT Mines Albi) during the first part of the project and on Sophia-Antipolis (CEMEF/PERSEE Mines ParisTech) during the second part. Short-term missions are also planned at Evry (CMAT) and on the sites of the other partners of the Carnot project.

3 – ACTIVITIES

The work will consist initially in analyzing the kinetics of matrix crystallization by calorimetry and by optical microscopy in polarized light, then in analyzing the influence of the presence of fibers on the

formation of transcrystalline structures. The detailed characterization of the properties of the fibers (roughness, surface tension) will then make it possible to establish correlations with the nucleation at the surface of the fibers and the crystal morphology.

The influence of aging and recycling on the properties of composites will then be studied through the analysis of changes in fibers (chemical, physical and mechanical) and the matrix. The consequences of these modifications on the crystallization of the fiber / matrix system will be looked at in particular.

Finally the consequences of chemical and physical treatments of fibers will be investigated in order to assess the contribution of these treatments to the properties of biobased composites.

Throughout the duration of the project, the post-doctoral fellow will interact with the various partners of the RecComBioS project in order to organize and coordinate the different phases of his/her work.

In addition, the post-doctoral fellow will ensure the scientific dissemination of his results (writing of articles, congress, popular science).

4 – TRAINING

The candidate will:

- hold a PhD in Material Science,
- have solid skills in the implementation of polymer and composite materials,
- have a knowledge of phase transitions of materials (crystallization) and mechanics of solids with the associated characterizations and modelings,
- have experience in polymer crystallization (characterization techniques, kinetics),
- demonstrate fluency in English.

Due to the collaborative context, the candidate will have to demonstrate autonomy, organization, rigor, and will have to show real teamwork skills.

5 – FURTHER INFORMATION

Information about the position:

Mme Séverine A.E. BOYER, CNRS researcher, team: BIO – Polymères and Composites Biosourcés – Centre de Mise en Forme des Matériaux, Sophia Antipolis - MINES Paris PSL

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Links to web sites of the research centers:

<https://www.cemef.mines-paristech.fr/>
<http://www.institut-clement-ader.org/>
<http://www.mines-albi.fr/presentation-ICA-albi>
<http://www.mat.mines-paristech.fr/>

Administrative Details:

Dina Ghadout-Brissy

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The successful candidate will be recruited as a private law contractor on a fixed-term contract (CDD) for 12 months under the provisions of the management framework of Armines. The duration of the contract can be extended by approximately 5 months, depending on budget allocations.

The monthly remuneration is around 2 400 Eur, net per month.

6 – APPLICATION

Application files with detailed CV and cover letter must be sent by email to:

severine.boyer@mines-paristech.fr * olivier.dealmeida@mines-albi.fr *

sebastien.joannes@mines-paristech.fr *

Application deadline: 2021/01/20

Planned starting date: 2021/03/01