

3 years PhD position

Centre for Materials Forming (CEMEF) of Mines Paris-PSL, Sophia Antipolis, France

Thermal Superinsulating Bio-Aerogels with Stable Performance and Sustainable and Cost-Efficient Processing

Project description

Reducing energy consumption plays a crucial role in decreasing climate change. Buildings generate around 35% of total greenhouse gases and use 40% of the total energy, mainly due to poor thermal insulation. High performing thermal insulation is also needed in packaging (protection of medical and pharmaceutical products), for pipelines, in appliances, etc. With societal demand towards healthier life and decrease in energy consumption, new high-performance breakthrough functional materials are urgently needed being also eco-friendly and with low carbon footprint.

The overall objective of the multi-partner ANR-funded national project IsoMat is to develop innovative bio-based thermal superinsulating materials with thermal conductivity below that of air, excellent long-term performance, and strong potential for technology transfer and industrial implementation.

The goal of the PhD project is to design bio-based aerogels —ultralight porous materials with high specific surface area and exceptional thermal insulation properties. Two major scientific and technological challenges will be addressed: (i) selecting appropriate physico-chemical modifications to prevent material aging while preserving their superinsulating performance, and (ii) developing processing strategies that eliminate the need for high- or low-pressure drying technologies, thereby enabling simpler, more cost-effective, and scalable manufacturing.

The work is at the frontier of polymer physics and physical chemistry, and materials processing. It will be carried out in close collaboration with academic and industrial partners within the IsoMat consortium. The research will involve formulation and processing of bio-based materials, rheological characterization, optical and electron microscopy, characterization of solutions, gels, and porous materials, measurements of thermal and mechanical properties, and the establishment of structure–property–processing relationships.

The experimental work will be performed in CEMEF/Mines Paris-PSL and in PERSEE/Mines Paris-PSL. CEMEF is world leader in the development of biomass-based materials, in particular, bio-aerogels, and PERSEE is renown expert in materials' thermal properties.

Keywords: polysaccharides, solutions, rheology, gels, aerogels, porosity, thermal conductivity

Skills: knowledge in polymer chemical physics, capability to work in group, fluent in English, mobility, motivation and sense of initiative and capability to report regularly on their work.

Duration: 3 years

Gross annual salary: about 26 k€/year.

The position is available from October 2026.

Application:

The position is for a student with Master degree or equivalent.

Please send your CV, motivation letter, your marks from the last two years and two emails of a reference person to Tatiana Budtova, email : tatiana.budtova@minesparis.psl.eu

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