

Internship announcement

Centre for processes, renewable energies and energy systems (PERSEE), Mines Paris - PSL
&
Centre for Materials Forming (CEMEF), Mines Paris - PSL

Bio-polymer aerogels as high-performance thermal insulation materials

Project description

Thermal insulation is a key factor in the design of buildings and is directly related to the energy efficiency. Insufficient thermal insulation leads to the emission of around 30% of the total greenhouse gases worldwide and it is linked to the performance of the insulating materials used. The most common insulating materials used in the building sector are mineral wool, synthetic polymer foams, and natural fibres with lowest thermal conductivity in the range of $0.030 - 0.035 \text{ W m}^{-1} \text{ K}^{-1}$. Only aerogels, apart from vacuum insulation panels, are known to be intrinsically thermal superinsulating materials, with thermal conductivity below that of air ($0.025 \text{ W m}^{-1} \text{ K}^{-1}$) in ambient conditions. This is due to aerogels' high porosity and nanostructure. To date, silica aerogels are known as the most performing thermal insulators in room conditions; however, academic and industrial research is looking for aerogels made from renewable resources. The potential of bio-based aerogels as high-performing insulation materials was revealed in the last decade, and several polysaccharide aerogels were shown to have thermal conductivity below that of the air in ambient conditions.

The aim of this project is to prepare bio-aerogels whose chemical and microstructural characteristics are adjusted to meet the needs of high-performance thermal insulation materials. In this respect, bio-polymer aerogels will be synthesized, and different modification techniques will be applied during the various stages of fabrication. The thermal insulation properties will be monitored by thermal conductivity measurements as a function of time in climatic chambers.

The work is experimental, and it will be carried out in two neighbouring research centres of Mines Paris: PERSEE that has in-depth expertise in aerogels for thermal insulation and CEMEF that is world leader in the development of biomass-based materials, particularly in bio-polymer aerogels.

Keywords: gels, bio-aerogels, polysaccharides, polymer chemistry, materials' processing, thermal conductivity of porous materials

Skills: knowledge in polymer chemistry and physics, capability to work in group, fluent in English, motivation and sense of initiative, and capability to report regularly on his/her work.

Duration: 3 – 6 months

Salary: 669.90 €/month

The position is available from January 2024.

Application:

The position is for a student of the last year of Master.

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

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