

PhD offer october 2020

Flame retardant expanded polypropylene for applications in electric vehicles: design and mechanism of action

Keywords: *polypropylene, flame retardancy, electric vehicle, fire standard, foam*

Skill area: *Materials chemistry - Plastics processing - Engineering*

A three year PhD position, co-funded by Hauts-de-France Region, I-SITE ULNE foundation and an international company, leader in the production of expanded polypropylene, is available starting from October 2020 at Lille University.

The candidate will be hosted in the group ISP (Ingénierie des Systèmes Polymères) of the laboratory UMET (Unité Matériaux et Transformations, UMR CNRS 8207) and in the company involved in the project, based in Hauts-de-France region.

The laboratory UMET is dedicated to Material sciences for a large range of applications. It hosts a large portion of the research in Materials Science of Lille University. See <http://umet.univ-lille1.fr/presentation.php?lang=en> for more details.

Subject of the thesis:

Due to the fire risks induced by batteries, the current transition from combustion-powered vehicles to electric vehicles leads to an increasing need in fire protection. To ensure driver and passengers' safety, plastics used in these vehicles must answer novel severe manufacturer specifications.

Expanded polypropylene (EPP) is widely used in automotive applications: it is a material of reasonable cost, combining energy absorption properties with high structural strength at very low weight. It also offers chemical resistance as well as thermal and acoustic insulation. However, its flammability does not meet the new fire regulations for electric vehicles, driving the need for innovative materials.

An international company, world leader in the production of EPP, and UMET, academic laboratory that has international recognition in fire safety, collaborate to (1) understand the mechanisms driving ignition of expanded polypropylene and (2) design solutions complying with the car manufacturers' specifications, taking into account environmental constraints (such as REACH).

To obtain EPP of low flammability, the PhD student hired will follow three approaches: (1) bulk incorporation of flame retardant fillers and synergistic agents during polypropylene extrusion, (2) application of a flame-retardant surface treatment on polypropylene beads before foaming and (3) coating of final EPP product with a flame-retardant formulation. The products obtained will be fully characterized, before and after burning, and their flammability will be assessed using instrumented UL-94 vertical test. Finally, ageing and recyclability of the most promising formulations will be assessed.

Candidates profile:

Highly motivated candidates with an academic degree at the Masters level in materials science, chemistry and/or chemical engineering are invited to apply for this position. Candidates should have a real interest for experimental science and must show teamwork and organizational skills as well as a sense of initiative. Previous experience in plastic processing or fire retardancy will be considered strong assets.

The knowledge of English is mandatory.

Spoken and written French is an asset.

Open communication, reporting and presentations skills will be necessary to succeed.

French Permis B is mandatory.

Application procedure:

In order to apply send by e-mail a CV, Covering Letter and Reference Letter to Prof. Maude JIMENEZ, maude.jimenez@univ-lille.fr