Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Aït Hocine Given names : Nourredine

Status (prof., assistant prof., …) : Prof

Laboratory :	Laboratoire de Mécanique Gabriel Lamé	Website address : https://www.mechlabgabriellame.fr/en/
Institution :	Institut National des Sciences Appliquées Centre Val de Loire (INSA-CVL)	Website address : https://www.insa-centrevaldeloire.fr/fr

Scientific competence of the supervisor:

Nourredine Aït Hocine is Full Professor of Mechanical Engineering since 2009 at INSA Centre Val de Loire, Blois. His research focuses on sustainable materials and advanced polymer technologies, including the recycling of waste polymers and rubbers, experimental characterization of physical and mechanical properties of polymer-based micro- and nanocomposites, finite element modeling of polymer behavior, and fracture mechanics of elastomers.Professor Aït Hocine has authored over 100 publications in high-impact journals and international conferences. He currently serves as an editorial board member and reviewer for several leading scientific journals.

Two major publications in the field proposed for the PhD :

1. ASARO, Lucia, et al. Devulcanization of natural rubber industry waste in supercritical carbon dioxide combined with diphenyl disulfide. Waste Management, 2020, vol. 118, p. 647-654.
2. AOUDIA, Karima, et al. Recycling of waste tire rubber: Microwave devulcanization and incorporation in a thermoset resin. Waste management, 2017, vol. 60, p. 471-481.

Website address of the personal page : https://www.researchgate.net/profile/Nourredine-Ait-Hocine

Supervisor's email : nourredine.aithocine@insa-cvl.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-7 and VI-3

Title : Recycling of Rubber Wastes by Devulcanization

Subject :

The objective of this research is to explore the potential for recycling rubber waste through devulcanization, specifically by selectively breaking carbon–sulfur (C–S) and sulfur–sulfur (S–S) bonds. To achieve this, a novel experimental protocol will be developed.
The properties of the devulcanized materials, as well as their blends with virgin rubber, will be thoroughly characterized to evaluate the quality of devulcanization. This assessment will involve microstructural, physico-chemical, thermal, and mechanical analyses. From an analytical standpoint, Horikx's theory will be systematically applied.
To optimize devulcanization performance, the influence of reagents and processing parameters will be investigated. Particular attention will be given to the treatment medium, including the presence or absence of fluid, as well as the type and volume of the fluid used.
Finally, the results obtained will be compared with existing data from the literature to benchmark the effectiveness of the developed method.

Keywords :

rubber wastes, recycling, devulcanization, circular economy

Expected collaborations :

IMT Europe Lille-Douai and Society "Revival" (Lille)

Background required from the applicant :

PhD student should have a solid background in polymer science. Prior experience in rubber processing, devulcanization methods, and key experimental techniques—such as FTIR, TGA, DSC, and SEM—will be highly appreciated. Competence in thermal-mechanical testing and a good understanding of green chemistry principles will be considered strong assets.

Existence of a PDF file detailing the proposal ("yes" or "no") : Yes

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