# Research Grants for PhD students from the China Scholarship Council

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

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| Supervisor's name : | CHETEHOUNA | Given names : | Khaled |
| Status (prof., assistant prof., …) : | Professor | | |
| Laboratory : | PRISME | Website address : | https://www.univ-orleans.fr/fr/prisme |
| Institution : | INSA Centre Val de Loire | Website address : | https://insa-centrevaldeloire.fr/en |

Scientific competence of the supervisor:

Prof. Khaled Chetehouna is an international expert on Fire and Engineering Sciences, and Vice-Chairman for Research for INSA Centre Val de Loire. He is head of the P2CF team at the PRISME Laboratory and a member of the strategic board of the CNRS French Research Group “Fires” n°2864. Co-directors of the thesis, namely Associate Prof. Huabin ZENG, his expertise is dynamic behavior of composites and cellular materials (foam, honeycombs, etc) under impact loading.

Two major publications in the field proposed for the PhD :

1. Asih Melati, Abdelhakim Settar, Khaled Chetehouna. and al., 2022 Intumescent Fire-Retardant Performance and Small-Scale Reaction Mechanisms on Banana/Bio-Epoxy Composites, SSRN Electronic Journal
2. Zeng H.B., Bailly P., 2017. Experimental characterization of dynamic behavior of gelatin-based material using DIC. Polymer Testing 63: 298-306

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| Website address of the personal page : | https://www.researchgate.net/profile/Khaled-Chetehouna |
| **Supervisor's email :** | khaled.chetehouna@insa-cvl.fr |

***Description of the research work proposed for a PhD*** ***Topic # (see list) :*** IV-10

Title : Experimental study on the mechanical behavior of green biocomposites under dynamic loads with the effect of thermal degradation

Subject :

Bio-based composites are evolving, with green biocomposites using both bio-based reinforcement and epoxy matrix. Flax fibers are replacing fiberglass in transport applications due to their lower energy cost and weight reduction. However, the drawbacks of low thermal stability and poor fire resistance have received little attention so far and few literatures focused on the dynamic behaviour of flax/epoxy biocomposites after thermal degradation under impact and choc, such as failure mechanisms, delamination, energy absorption, etc. In order to reduce the delamination damages of biocomposites, Tufting, a single thread method is proposed. Tufting generates thread through-thickness reinforcement without interlocking the threads. Additionally, fire retardant treatments are employed to enhance thermal stability and fire resistance. A 20mm diameter steel Hopkinson pressure bar (SHPB) tests will be performed on the biocomposites . The SHPB is a powerful tool to study the behaviour of materials at high strain rates. Dynamic compression tests will be performed on flax/epoxy biocomposites with and without tufting reinforcement and with and without fire retardant treatments to obtain the dynamic mechanical characteristics. The comparison of these test results will help to understand the effect of tufting reinforcement and fire retardant treatments on the failure mechanisms and to optimizer the conception of biocomposites.

Keywords :

large strain, high strain rate, green biocomposites , SHPB, dynamic behaviour, thermal degradation

Expected collaborations :

Mechanical Gabriel Lamé Laboratory

Background required from the applicant :

Master degree in mechanics with strong background in mechanics of continuous media, mechanical behavior of materials. Good knowledge will be appreciated in dynamic behavior of materials at high strain rates and in Finite Element Analysis under impact loading.

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

*(see guidelines on the website www-csc.utt.fr)*