

# Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website [www-csc.utt.fr](http://www-csc.utt.fr))

Supervisor's name : AIT HOCINE Given names : Nourredine

Status (prof., assistant prof., ...): Professor in mechanical engineering

Laboratory : Laboratoire de Mécanique Gabriel Lamé Website address :

Institution : INSA Centre Val de Loire Website address :  
[www.insa-centrevaldeloire.fr](http://www.insa-centrevaldeloire.fr)

Scientific competence of the supervisor:

Research interests: Mechanical engineering, material science, physics, polymers, nanocomposites, experimental testing, numerical modeling.

Reviewer for several international journals: Polymer Engineering & Science, Journal of Applied Polymer Science, Journal of Polymer Engineering, Journal of Thermoplastic Composite Materials, International Journal of Solids and Structures, Macromolecular Materials and Engineering, Chemical Engineering Communications ...

Two major publications in the field proposed for the PhD :

1. M. Chatti, A. Frachon, M. Gratton, M. Caliez, D. Picart, N. Ait Hocine. Modelling of the viscoelastic behaviour with damage induced anisotropy of an aggregate material... Int. J. Solids Struct., 2019, 168:13-25.
2. G. Cheng, M. Sahli, J.C Gelin, T. Barriere, Physical modelling, numerical simulation and experimental investigation of microfluidic devices with amorphous... J. Mater. Process Tech., 2016, 229:36-53.

Website address of the personal page :

**Supervisor's email :** [nourredine.aithocine@insa-cvl.fr](mailto:nourredine.aithocine@insa-cvl.fr)

**Description of the research work proposed for a PhD** **Topic # (see list) :** IV-10;IV-13;VI-1

Title : Experimental and numerical investigation of the mould filling during compression process of nanocomposites.

Subject :

The manufacturing process with polymers and their composites have been widely developed in recent years. The filling of the macro and micro cavities in the die mould is an essential step in these processes, because the filling ratio dominates the replication efficiency of the manufacturing structure. The objective of this PhD thesis is to optimise the thermoplastic compression moulding process to elaborate competitive polymer based products. The research work will start by the characterization of the thermal and mechanical properties of the material. The die mould with specific geometry and dimension will be designed and fabricated by additive manufacturing, and then used to elaborate the polymer based components. The components obtained with various processing parameters will be compared to analyse their effects on the filling efficiency of the die mould cavities. The physical behaviours of the polymers and nanocomposites will be characterized by experimental tests. The viscoelastic and viscoplastic constitutive laws based on integer and fractional order will be used to describe the materials' deformation during the compression process. The numerical simulation of the compression process will be achieved using finite element method. The comparison between the experimental and simulation results will be performed to verify the efficiency and accuracy of the proposed models.

Keywords :

Materials and polymer processing, additive manufacturing, mechanical experiment, numerical modelling and simulation

Expected collaborations :

Professor Thierry BARRIERE  
Univ. Bourgogne Franche-Comté, FEMTO-ST Institute, CNRS/UFC/ENSMM/UTBM, Department of Applied Mechanics, 25000 Besançon.

Background required from the applicant :

Material knowledges, mechanical engineering, computing skills, material forming process, characterization of material behaviour.

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

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