

# 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. H. Hassan, N. Aït Hocine, P. Médéric, M-P. Deffarges. Thermal and mechanical properties of PA12/C30B nanocomposites in relationship with nanostructure. J. of Applied Polymer Science. V. 132, 18, 1-10, 2015.
2. G. Cheng, M. Sahli, J.C Gelin, T. Barriere, Physical modelling, numerical simulation and experimental investigation of microfluidic devices with amorphous thermoplastic...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

Title : Experimental and numerical investigation of the mould filling during compression process of unfilled polymers and filled polymers

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. Polymers are considered as important materials in micro replication process due to their low cost and to their wide range of physical properties. 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, then the viscoelastic and viscoplastic constitutive laws 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 die mould with specific geometry and dimension will be designed and fabricated, and then used to elaborate the polymer based components. The comparison between the experimental and simulation results will be performed to analyse the processing parameters' sensibility on the filling efficiency of the die mould cavities. The main objective of this project is to propose the efficient numerical tool allowing optimisation of the compression process.

Keywords :

Polymers, mould filling, experimental tests, numerical modelling.

Expected collaborations :

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

Background required from the applicant :

Polymers, mechanical engineering, material science, experimental testing, finite element method.

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

(see guidelines on the website [www-csc.utt.fr](http://www-csc.utt.fr))