

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 : Rachik Given names : Mohamed

Status (prof., assistant prof., ...) : Assistant professor (with Habilitation to supervise research)

Laboratory : Laboratoire Roberval, FRE CNRS-UTC 2012 Website address : <http://roberval.utt.fr/>

Institution : Sorbonne universités, Université de technologie de Compiègne Website address : www.utt.fr

Scientific competence of the supervisor:

- Constitutive modeling of materials including rate dependent and pressure dependent elastoplasticity and hyperelasticity.
- Algorithms for constitutive model integration
- Constitutive model calibration with inverse analysis
- Development of load stepping algorithms for non linear problems with special interest in non iterative schemes (4th order Runge-Kutta)

Two major publications in the field proposed for the PhD :

1. J.S. Li, R.N. Raelison, T. Sapanathan, G. Racineux, M. Rachik. Assessing the influence of fieldshaper material on magnetic pulse welded interface of Al/Cu joints. *Procedia Manufacturing*, Vol 29, pp. 337-344,
2. J.S. Li, R.N. Raelison, T. Sapanathan, Z. Zhang, X. G. Chen, D. Marceau, Y.L. Hou, M.Rachik, An anomalous wave formation at the Al/Cu interface during magnetic pulse welding. *Applied Physics letters*, 116

Website address of the personal page : https://www.researchgate.net/profile/Mohamed_Rachik2

Supervisor's email : mohamed.rachik@utt.fr

Description of the research work proposed for a PhD Topic # (see list) : VI-1

Title : Optimizing weld properties and processing conditions of magnetic pulse welding

Subject :

Joining dissimilar metals with different thermal properties using traditional fusion welding processes remains a challenging task. Magnetic pulse welding (MPW) is a solid state process that enables to join dissimilar metals using high speed impact without creating a weld pool. MPW involves multiphysics phenomena under fast dynamic conditions that affect the materials microstructure and the joint properties. A great deal of research was undertaken to understand the interface dynamics and formation during impact welding and especially the intermediate layer metallurgy (transition zone between the two materials). But the relation between the interface morphology/microstructure, the bonding strength and the joint bearing capacity is still an open issue. This is the major objective of this PhD subject which will investigate the relation between the process parameters and the multi-physics and transient response of the interface during the high strain collision. The overall objective is to build a weldability window based on solid physical foundations. The PhD candidate will establish material/process interactions governing the MPW behavior in order to predict and specify the weldability conditions for various metals combinations. The numerical simulation will be performed with Abaqus and LS-Dyna software.

Keywords :

weld properties, characterization, modelling, optimization

Expected collaborations :

*R.N. Raelison, Université de Bourgogne Franche-Comté - UTBM, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS, 90100 Belfort, France

*G. Racineux, Ecole Centrale de Nantes, Institut de Recherche en Génie Civil et Mécanique – UMR 6183 CNRS Nantes, France

Background required from the applicant :

Material science, Mechanics of materials, Computational mechanics, Heat transfer, Metallurgy

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

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