

PhD Grants from the China Scholarship Council: Co-operation Program with the UTs and INSAs (France), Program 2021

Thesis subject:

Characterization and modelling of mechanical properties generated by high strain-rate shearing.

Keywords:

Metals, high strain rate, properties, modelling, homogenization, constitutive law

Description:

A high strain rate shearing enables complex kinematics and non-equilibrium transformations that can generate structural changes with gradient properties [1–5]. The constitutions, the morphologies and the phases within the structure can result in enhanced mechanical and physical properties [6]. Thus, the macroscopic mechanical behaviour of the materials is strongly dependent to the microstructure generated by the high-strain shearing. Our objective is to develop computational model capable of predicting macroscopic properties based on the nature of such microstructure using homogenization technique [7,8]. The micromechanical approaches will be combined with various experimental characterization (SEM, EBDS, TEM) to identify and generate computational microstructures. The prediction of the macroscopic properties (elastic-plastic bulk behaviour coupled with damage evolution) will be performed for various loading scenarios. Then, the candidate will develop knowledges about the metallurgical transformations due to high strain rate shearing and the properties they create. The predictive models will serve as computation tool for finding suitable structures for optimum properties. The numerical modelling will be performed using Matlab and Abaqus packages.

Expected background of the PhD candidate:

Computational material science, Mechanics of materials, Finite element method, Structural characterization

Supervision of the research works and collaboration:

Supervisor: M. Rachik ¹

Collaboration: R.N. Raoulison ², Y. Hou ³, T. Sapanathan ⁴

¹ Sorbonne universités, Université de technologie de Compiègne, Laboratoire Roberval, CNRS UMR - 7337, Centre de recherche Royallieu, Compiègne, France

² Université de Bourgogne Franche-Comté - UTBM, Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS, 90100 Belfort, France

³ School of Mechanical Engineering, Zhengzhou University, China

⁴ Institute of Mechanics, Materials and Civil Engineering, Université catholique de

Louvain, B-1348 Louvain-la-Neuve, Belgium

Contact :

Mohamed Rachik : Maître de Conférences HDR, mohamed.rachik@utc.fr

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