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 : Chazeau | Given names : Laurent

Status (prof., assistant prof., …) : Professor

Laboratory : MATEIS | Website address : www.mateis.insa-lyon.fr/en

Institution : INSA Lyon | Website address : www.insa-lyon.fr/en/

Scientific competence of the supervisor:

Microstructure-mechanical properties relationship, modelling of amorphous and heterogeneous materials (glasses, polymers), modelling, composite materials, plasticity, fracture. Additionally in our team we have experience in the field of bulk metallic glasses, mechanical properties (indentation, DMA, compression tests), microstructural characterization (TEM, SEM, XRD)

Two major publications in the field proposed for the PhD :

1. G. Lyu, J.-C. Qiao, Y. Yao, J.-M. Pelletier, D. Rodney, J. Morthomas, C. Fusco, "Dynamic correspondence principle in the viscoelasticity of metallic glasses", Scripta Materialia 174, 39 (2020)
2. J.-C. Qiao, Q. Wang, J.-M. Pelletier, H. Kato, R. Casalini, D. Crespo, E. Pineda,Y.Yao, Y. Yang, "Structural heterogeneities and mechanical behavior of amorphous alloys", Progress in Materials Science 104, 250 (2019)

Website address of the personal page : http://mateis.insa-lyon.fr/en/content/laurent-chazeau

Supervisor's email : laurent.chazeau@insa-lyon.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-8

Title : Improving the ductility of bulk metallic glasses by rejuvenation

Subject :

Bulk metallic glasses (BMG) have remarkable structural and mechanical properties due to the absence of long-range order: high toughness, exceptional mechanical strength, elastic deformation almost ten times larger than their crystalline counterparts, which has made them a subject of study since the 90s for their potential structural and industrial applications (for micromechanics, jewelry and biomaterials). On the other hand the Achilles heel of these materials is their low ductility at room temperature. As a clear structural description of the BMG is still absent their deformation mechanisms are far from being understood. This thesis is in line with previous works performed in our group on the study of the mechanical properties of metallic glasses. The aim of this PhD project is to better understand the physical mechanisms at the molecular scale responsible for the mechanical behaviour of BMG by establishing a link between the local atomic dynamics, the material microstructure and the observed mechanical properties. From this fundamental study, our second objective is to assess under which mechanical and thermal conditions BMG can be rejuvenated to enhance their ductility.

Keywords :

metallic glasses, modelling, amorphous materials, mechanics

Expected collaborations :

Collaborations are expected with the team “Metals” of the MATEIS lab which has an outstanding experience in the study of metallic materials and especially in numerical techniques. There will also be an active collaboration with Tristan Albaret, professor at the University Lyon 1, on the aspects related to the analysis of the plasticity of BMG.

Background required from the applicant :

physicist or mechanical engineer with a good knowledge of materials science and of numerical simulations techniques

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

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