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 : Joly-Pottuz Given names : Lucile

Status (prof., assistant prof., …) : Associate professor

Laboratory : MATEIS Website address : http://mateis.insa-lyon.fr/

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

Scientific competence of the supervisor:

TEM in situ mechanical testing
Characterization of materials using TEM, SEM or XRD.
Member of Microscopy group and ceramic group of MATEIS Lab

Two major publications in the field proposed for the PhD :

1. Real time TEM observation of alumina ceramic nano-particles during compression. E. Calvié, L. Joly-Pottuz, C. Esnouf, P. Clement., V. Garnier, J. Chevalier, Y. Jorand, A. Malchere, T. Epicier, K.
2. CeOx elastic properties: an in situ ETEM nanocompression study. Joly-Pottuz L, Zhang R., Albaret T., Epicier T., Jenei I., Cobian M., Stauffer D., Masenelli-Varlot K., JOM, 2024, 76: 2326-2335

Website address of the personal page :

Supervisor's email : lucile.joly-pottuz@insa-lyon.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-2 and IV-12

Title : In situ testing of ceramic materials inside transmission electron microscope

Subject :

Development of in situ nanocompression and nanofriction experiments in an environmental transmission electron microscope (ETEM) is the core of this project. First results obtained during a previous CSC PhD work are very promising and show the intere to develop nanomechanical tests under environment inside a TEM. The experiments will be carried out on several types of ceramics, among which ceria or alumina.
Ceria is a crucial component of automotive catalysts and is developed for Solid Oxide Fuel Cell applications. Ceria nanocubes will be studied since nanocube geometry is an interesting geometry since data processing and simulation works are easy to be performed. Alumina nanoparticles have a spherical shape and a more complicated structure but are used to process alumina bulk materials used in various applications. Optimization of the imaging conditions (high resolution imaging and dark field imaging) are planned to observe the deformation mechanisms in the nanoparticles. Experimental and simulation works being complementary, a collaboration with scientists specialized in simulation works is also planned.

Keywords :

in situ testing; transmission electron microscopy; deformation mechanism

Expected collaborations :

collaboration with scientists specialized in simulation works; collaboration with other scientists of MATEIS laboratory (ceramic group) to choose interesting samples to be tested by in situ TEM nanocompression

Background required from the applicant :

Physics. Knowledges in mechanical testing and deformation mechanisms of materials, or characterization of materials by scanning or transmission electron microscope would be appreciated.

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

(see guidelines on the website www-csc.utt.fr)