Post-Doctoral position:

Mechanical behaviour of a β-metastable titanium alloy in the β→α+β phase transformation temperature range

The present post-doctoral position will take place at Institut Jean Lamour (CNRS – Université de Lorraine, http://ijl.univ-lorraine.fr), within the research group "Microstructures et Contraintes". It will be funded by the Laboratory of Excellence (Labex) DAMAS, (Design of alloy metals for low-mass structures).

One topic of the research group concerns the understanding and the modelling of the coupling between the thermal, mechanical and metallurgical phenomena that occur during thermomechanical processing of metal alloys, in order to predict the microstructure, the mechanical properties, the residual stresses and the deformations inside massive pieces. This requires understanding the thermomechanical behaviour, coupled to phase transformations that occur in the temperature range spanned during the treatments.

The project will be focused on the experimental study of the stress/strain – phase transformations interactions in a β-metastable titanium alloy, the Ti17 alloy. Externally applied stresses can induce phase transformation plasticity and affect phase transformation kinetics. In return, microstructure evolutions affect the mechanical behaviour because of the phase transformation strain. These interactions have not been much studied in titanium alloys, in particular in β-metastable alloys, and contrary to the case of steels. Preliminary experimental results indicate that these interactions are significant in the Ti17 alloy.

The following aspects will be studied experimentally by performing thermo-mechanical tests at controlled temperature evolutions, selected such that the β → α+β phase transformation will take place:

- Phase transformation plasticity: influence of the applied stress, of phase transformation kinetics, mechanism (diffusive, martensitic), of the nature, morphology (acicular or coarse colonies), amount and distribution of the product phase, which depend on the temperature evolution.
- Effect of an externally applied stress on phase transformation kinetics. The effect of a small plastic strain (<1%) will be examined as well.

Thermo-mechanical behaviour characterizations will be complemented by microstructure characterisation (optical and electron microscopies). If necessary, possible orientation of the phase transformation products will be examined by using the EBSD technique.
Depending on the progression of the project, in-situ characterization with synchrotron X-ray diffraction can be envisaged, as well as the development of a thermo-elasto-visco-plastic mechanical behaviour law coupled to microstructural evolutions.

Duration

12 months from March 2015. The post-doc duration can be extended to 18 months.

Profile

PhD in Materials Science (metallurgy, titanium alloys, etc..)

Skills

Experimental characterisation of mechanical behaviour.

Application

Please send your CV and your cover letter to: julien.teixeira@univ-lorraine.fr

Contact

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