6th European Conference on Computational Mechanics (Solids, Structures and Coupled Problems) (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
June 11- 15, 2018, Glasgow, UK

COMPUTATIONAL MODELING AND EXPERIMENTAL INVESTIGATIONS OF METALLIC MATERIALS ACROSS SCALES

BENJAMIN KLUSEMANN[*#] AND FRANZ ROTERS[†]

[*] Leuphana University of Lüneburg, Institute of Product and Process Innovation
Scharnhorststraße 1, 21335 Lüneburg, Germany
benjamin.klusemann@leuphana.de and www.leuphana.de

[#] Helmholtz-Zentrum Geesthacht, Institute of Materials Research
Max-Planck-Straße 1, 21502 Geesthacht, Germany
benjamin.klusemann@hzg.de and www.leuphana.de

[†] Max Planck Institut für Eisenforschung, Microstructure Physics and Alloy Design
Max-Planck-Straße 1, 40237 Düsseldorf, Germany
f.roters@mpie.de and www.mpie.de

Key words: material modeling, heterogeneous materials, microstructure, multiscale modeling, material instabilities, experimental characterization, experimental-modelling correlation.

ABSTRACT

The relation between microstructure and macroscopic constitutive response is crucial in the design and modelling of metallic solid materials. To interpret and model the material behaviour it is essential to analyse and understand the interactions of different, even competing mechanisms at the different underlying length scales, for example strain hardening and defect pattering mechanisms. Therefore, multiscale approaches have received significant attention from the scientific community. However, the complexity of the underlying mechanisms makes it a difficult task to develop comprehensive constitutive models at each scale. Additionally, a number of challenges still exists in the development of consistent multiscale approaches to link the information between the different scales. An extended and valid understanding of the relevant mechanisms can only be obtained in a multidisciplinary context, where the experimental observations and model concepts are linked strongly across the scales. In particular, experimental observations, i.e., through TEM, EBSD or other advanced characterisation methods, have to be used to validate the proposed model formulation. In turn, this provides a further physical understanding of the material behaviour and allows the optimization in terms of material design as well as production processes and necessary post-treatment. The Minisymposium aims to bring scientists from material science and material modelling together and to show recent developments in material characterization, constitutive modelling and multiscale methods. Therefore we invite experimental and modelling contributions concerned with multiscale methods, microstructure modelling as well as experimental-modelling correlations.