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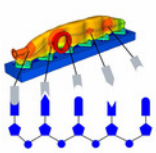

Mechanik-Seminar / Graduiertenkolleg 1483

Referent: **Dr. Matthieu Mazière**
Centre des Matériaux - Mines ParisTech, France

Datum: Dienstag, 05.07.2011
Uhrzeit: 17:00 Uhr
Ort: Geb. 10.23, KM-Seminarraum, R 308.1

Thema: **Numerical simulation of the Portevin - Le Chatelier effect in various materials and at different scales**

Abstract

Many metallic materials exhibit serrations on their global tensile strain/stress curve in a given range of temperature and deformation rate. The so-called Portevin - Le Chatelier effect is due to the interaction between mobile dislocations and solute atoms diffusion denoted dynamic strain ageing. The mechanical model proposed by MacCormick, Estrin, and Kubin [1, 2] describing dynamic strain ageing is used in this work at different scales for numerical simulations of an Al alloy, an Al-Al2O3 composite, a steel, and a nickel based superalloy.
The model parameters are firstly identified for an Al alloy, accounting for the critical plastic strain (i.e. when serrations occur). These parameters are used for the matrix in a periodic cell to simulate the homogenized response of the Al-Al2O3 composite at a microscopic scale.
The model parameters are identified for a steel for numerous temperatures. Their dependence on the temperature is investigated in order to follow physical evolutions. Parameters are then used to simulate tensile tests performed on smooth and notched specimens at different temperatures and different strain rates.
A set of model parameters for a nickel based superalloy is used for the simulation of the PLC effect in a rotating turbine disk. The PLC effect is found to change the global equilibrium curve of the disk, and the stress field in it, but not its burst rotation rate.
A preview of the presentation content can be found on the following web site dedicated to our different projects related to strain ageing in metals:
http://www.mat.ensmp.fr/Pages/maziere/Synthesis/index.htm

References:
[1] McCormick, P. G. and Ling, C. P.: Numerical modeling of the Portevin – Le Chatelier effect. Acta metall. mater. Vol. 43, Issue 5, (1995) 1969-1977
[2] Mazière, M., Besson, J., Forest, S., Tanguy, B., Chalons, H., Vogel, F.: Numerical aspects in the finite element simulation of the portevin-le chatelier effect, Computer Methods in Applied Mechanics and Engineering 199 (9-12) (2010) 734–754

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Alle Interessenten sind herzlich eingeladen.
Prof. Dr.-Ing. Thomas Böhlke