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

Multi phase-field approach for anisotropic fracture in polycrystalline materials under thermomechanical loadings

D. Juhre[1] **and Z. Liu**[1]

[1] Institute of Mechanics / Department of Mechanical Engineering, Otto von Guericke University Magdeburg, Magdeburg, Germany, daniel.juhre@ovgu.de

Keywords: *Thermomechanical Problems, Phase-Field, Crack Propagation, Polycrystals, Anisotropic Elasticity*

Phase-field modelling has emerged as a powerful numerical method to simulate fracture processes with significant success [1]. Phase-field-type diffusive crack approach is capable of predicting the crack initiation, propagation and failure without any additional criterion. The study of fracture under thermomechanical loadings is a numerically difficult topic since the temperature field is treated as an additional degree of freedom. Further the extension to consider properties referring to the polycrystalline microstructure is not well established until today [2,3]. Within this scope the anisotropic material behavior, the preferential cleavage directions within each randomly oriented crystal and the anisotropic Fourier heat conduction has been taken into account. Several numerical benchmark tests of complex crack nucleation and propagation in 2D models of polycrystals under thermomechanical loadings are carried out.

REFERENCES

[1] V. Hakim, A. Karma, Laws of crack motion and phase-field models of fracture. *J. Mech. Phys. Solids*, Vol. **57** (2), pp. 342–368, 2009.

[2] B. Li, C. Peco, D. Millan, I. Arias, M. Arroyo, Phase-field modeling and simulation of fracture in brittle materials with strongly anisotropic surface energy. *Int. J. Numer. Meth. Eng.*, Vol. **102**(3-4), pp. 711–727, 2015.

[3] J. Clayton, J. Knap, Phase field modeling of directional fracture in anisotropic polycrystals. *Comput. Mater. Sci.*, Vol. **98**, pp. 158–169, 2015.