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NOVEL COMPUTATIONAL METHODS IN MULTI-FIELD MODELING OF MATERIAL FAILURE

A MINISYMPOSIUM ON THE OCCASION OF MICHAEL ORTIZ 65TH BIRTHDAY

TRACK NUMBER 100 - FRACTURE, DAMAGE AND FAILURE MECHANICS

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ABSTRACT

An open challenge in computational mechanics is the prediction of material failure, damage, crack growth, and the extent of fragmentation in solids. In a multi-field environment the modeling of the material is per se demanding; in addition, the intricate and irregular structure of cracks renders numerical simulations of cracking bodies difficult.

Recently, several innovative approaches have emerged, such as phase field methods, eigenfracture, eigenerosion, level-set and data driven methods. Some of approaches are characterized by a regularization of the evolving crack boundaries with an additional small but finite length scale. This length scale arouses new questions and doubts, in particular concerning multi-physic problems. For example, in constitutive modeling the attainment of a thermodynamic consistent Helmholtz free energy density becomes a challenging task.

In this minisymposium we would like to draw attention to computational strategies for multi-field fracture problems by illustrating the most innovative -not necessarily the currently most popular- techniques, for instance by direct adjustments between experimental and numerical results. The minisymposium will cover several aspects of research, starting from specific methods of choice and numerical strategies to theoretical aspects of constitutive modeling in a multi-field setting. Particular emphasis will be laid on pioneering discretization methods for the solution of coupled non-linear problems at different length-scales.