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MULTISCALE METHODS FOR COMPLEX MICROSTRUCTURES

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ABSTRACT

To ensure that materials are used in a resource-efficient manner, the accuracy of predicting material behaviour is becoming increasingly important. The underlying microstructure and lower scale effects such as crystal plasticity, phase transformation and dynamic recrystallisation have a strong influence on the macrostructural material behaviour. However, the representation of complex materials is a major challenge in terms of the importance of making reliable predictions. In addition, the consideration of multiphysical effects, e.g. due to thermo-mechanical, electromagnetic or electro-chemical loading, further increases the complexity of the material description. Furthermore, the high-resolution consideration of heterogeneous microstructures leads to high computational costs and has motivated the development of model order reduction techniques to reduced calculation times.

As a contribution to this challenging research area, the invited session will address the development of multiscale methods for predicting microstructural changes. Particular emphasis will be placed on, but not limited to

- multiscale methods for evolving microstructures (crystal plasticity, phase transformation, dynamic recrystallization…)
- multiscale methods for coupled problems (mechanical, chemical, thermal, electrical, …)
- model order reduction techniques to increase the solutions efficiency of multiscale methods (FE², FE-FFT, …)
- generation of representative volume elements
- experimental validation