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Multiscale Modeling, Homogenization and Microstructures in Solid Mechanics

Scientific area: Computational Solids And Structural Mechanics

In modern industrial applications, the demands on modern materials are constantly increasing in order to cope with toady's challenges of responsible resource usage. Materials and components manufactured therefrom, must embody a wide variety of properties, such as increased hardness combined with good ductility or increased stiffness combined with weight reduction. In many cases, these enhanced material properties originate from the underlying microstructure of the material. To consider effects of interaction of length scales in a numerical simulation, multiscale approaches are of great importance, in which microscopic effects are not only described phenomenologically in a macroscale model, but the microscale is fully resolved at each macroscopic point and the mutual effects are taken into account. The upscaling from the microstructure to the macroscale through homogenization is an important aspect therein.

This minisymposium focuses on multiscale modeling, homogenization and microstructures in solid mechanics. Different homogenization schemes such as a direct micro-macro transition approach (FE^2) or an FE-FFT based method can be utilized in order to account for different scales. On minor level, a representative volume element (RVE) has to be defined, which has to include all necessary information. Therewith, microstructural interactions or effects, such as microheterogeneities, phase transformation or recrystallization processes can be depicted. The analysis of relevant measures in the microstructure can provide an insight which is often impossible in classical experiments or single scale simulations.

Organizers:

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