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MULTISCALE APPROACH FOR NONLINEAR INELASTIC BEHAVIOR OF HETEROGENEOUS MATERIALS

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Summary. In this work we review the main ideas on how to account the main role of heterogeneities in governing nonlinear inelastic behavior of engineering materials. The discussion concerns all the pertinent aspects of nonlinear analysis, design and identification..

EXTENDED ABSTRACT

In this work we address several issues pertaining to efficiency of the computational approach geared towards modeling of inelastic behavior of a heterogeneous materials with microstructure, which is represented by a multiscale model. We elaborate upon both cases, where two-scale computation can be uncoupled and where the scales remain coupled throughout the computations, implying a constant communication between the finite element models employed at each scale.

We also discuss different manners of representing a complex multi-phase microstructure within the framework of the finite element model constructed at that scale, selecting a model problem of two-phase material where each phase has potentially different inelastic behavior. We conclude presentation with considerations of microstructure optimization problems. Both computational aspects for coupled nonlinear mechanics-optimization problem and the optimal choice of design variables are addressed.

Further details can be found in our recent works [1,2,3,4,5,6,7].

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