
Preface

Ideally, in an attempt to reduce laboratory expenses, one would like to make predictions of a new material's behavior by numerical simulations, with the primary goal being to accelerate the trial and error experimental testing. The recent dramatic increase in computational power available for mathematical modeling and simulation raises the possibility that modern numerical methods can play a significant role in the analysis of heterogeneous microstructures. This fact has motivated the work that will be presented in this monograph, which contains basic homogenization theory, as well as introductions to topics such as microstructural optimization and multifield analysis of heterogeneous materials. The text can be viewed as a research monograph, suitable for use in a first year graduate course for students in the applied sciences, mechanics and mathematics with an interest in the computational micromechanical analysis of new materials.

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