Micromechanics-based multiscale analysis for heterogeneous materials

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Abstract

For a multiscale modelling and simulation of heterogeneous materials across length scale, i.e., porous materials and particle-reinforced composites, a systematic micromechanics based multiscale analysis framework using the theory of localisation and homogenisation and digital material representation (DMR) has been developed and ustilised to fabricate and evaluate their overall material properties and mechanical behaviours.

In this study, some aspects on developing such a multiscale analysis of heterogeneous materials are further investigated via conducting a comparativeness analysis on the setting-ups of periodic boundary conditions of representative volume element (RVE). The comparativeness analysis is untislised to show the influence from these different boundary conditions on the material properties extracted. To validate and verify the proposed algorithm and approach in current research, the obtained numerical results are compared with the experimental data available in literature.

Keywords: Multiscale analysis, micromechanics, heterogeneous materials and finite element analysis.