# MULTISCALE ANALYSIS OF HETEROGENEOUS MATERIALS

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A combined method with a multiscale physics-based material model and a multiscale calculation method [1-4] is presented. This method is developed to simulate the localized deformation of heterogeneous materials. In the material modeling part, the effect of material microstructure is taken into account by adding a concept of mesocell to the micromorphic continuum [5], where the deformation fields are decomposed into the macroscale and microscale components. Multifield conservation equations are obtained by the principle of virtual power [6]. The constitutive relation of the material in microscale is established based on the material microstructure. The constitutive relation in macroscale is determined by averaging the internal power density over the mesocell. Therefore, this material modeling naturally passes the length scale from microscale to macroscale. The multifield conservation equations are discretized by coarse and fine finite element meshes. In theory, both meshes cover the entire domain, but in practice, computations on most of the fine meshes are avoided by employing the bridging scale concurrent calculation method [1-4]. This calculation method seamlessly bridges the solution from the fine mesh with the solution from the coarse mesh, and enhances the efficiency without sacrificing the accuracy. Dynamic shear localization problems of granular materials and metals are presented to illustrate the method.

**References**

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