Multiscale computation and convergence for coupled thermoelastic system in composite materials.

Summary: This paper discusses the multiscale computation for linear time-dependent thermoelastic equations in composite materials with a periodic microstructure. The new contributions presented in this study are the formulation of the correction terms and the strong convergence result with an explicit rate for the second-order multiscale solutions. By application of the Laplace transform, the multiscale method is developed for the static coupled thermoelastic system instead of the original time-dependent equations. Numerical results are reported to demonstrate that the proposed method has a competitive advantage for solving the dynamic thermoelastic system in three-dimensional composite materials. Moreover, the method is highly suitable for parallel computation.

Keywords: linear time-dependent coupled thermoelastic equations; homogenization; multiscale asymptotic expansion; Laplace transform; finite element method; composite materials
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