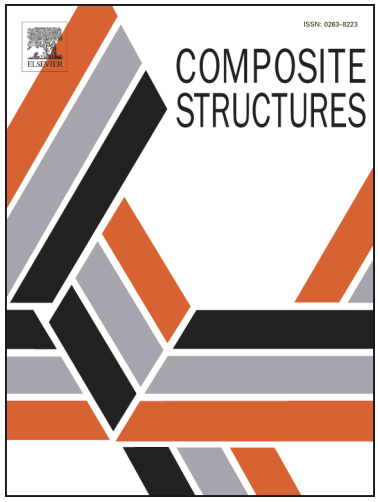

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Homogenized and Localized Responses of Coated Magnetostrictive Porous Materials and Structures

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Abstract

The homogenized properties and localized field distributions of coated magneto-strictive porous heterogeneous materials are extensively investigated using the extended Finite Volume Direct Averaging Micromechanics (FVDAM) with coupled mechanical-magnetic capabilities. Both square and hexagonal microstructures are employed to mimic different hollow coating arrangements. In order to validate the present technique, the corresponding finite element model is constructed in *Abaqus* to provide rigorous comparisons, and no visible difference is observed between two different models' predictions. The effects of the thickness of coatings are tested on the effective and local responses, where the hollow coatings play significant roles in the variations of homogenized properties and transmissions of stress concentrations. Finally, a two-step multiscale framework is established on periodic wavy structures, wherein the layers are composed of $CoFe_2O_4$ material reinforced by $BaTiO_3$ hollow coatings with two different volume fractions. The amplitude-to-wavelength ratio is varied to effectively study its impact on the field distributions of homogenized layers and local microstructures.

Keywords: Magnetostrictive Materials; Finite-Volume Micromechanics; Multiscale