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INFLUENCE OF MICROSCOPIC BOUNDARY CONDITIONS ON THE EFFECTIVE RESPONSE OF MREs

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Magnetorheological elastomers (MREs) are composites whose mechanical behaviour highly depends on the applied magnetic field. Since explicit constitutive laws for such heterogeneous materials are not specified, their effective macroscopic properties can be estimated from the response of the underlying micro-structures using homogenization procedure.
In this contribution, the behavior of heterogeneous magnetorheological composites subjected to large deformations and external magnetic fields is investigated. A fully-coupled FE2 homogenization procedure is used to derive the macroscopic material response from the averaged responses of the underlying microstructures. The microstructures, which are different in size and particle distribution, are significantly smaller than the characteristic length of the macroscopic problem. In particular, different sets of boundary conditions are applied to solve the problem at the micro-scale. The results indicate that the application of each set of boundary conditions renders different macroscopic responses [1, 2, 3].

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