

Mean Field Homogenization of Elasto-(Visco) Plastic Composites: Formulation for Time-Dependent and Independent Behaviors

Issam Doghri, Olivier Pierard

CESAME, Université Catholique de Louvain, Louvain-la-Neuve, Belgium

Different formulations for the homogenization of elasto-(visco)plastic composites are examined. In the rate-independent case, a robust and generic incremental formulation using algorithmic tangent operators and implicit time-discretization has been developed. One particularity is that the Eshelby's tensor is computed with the isotropic part of the tangent operator. All the other computations are performed with the anisotropic algorithmic modulus. An extensive validation of this method has been achieved. For rate-dependent elasto-plasticity, an affine formulation is adopted. By the help of Laplace–Carson transform, the constitutive law is changed into a fictitious thermo-elastic one. The homogenization is performed in the Laplace domain, a numerical inversion is achieved to get the equivalent temporal functions and finally, the macroscopic response can be computed.

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