

in collaboration with

Centro di Simulazione Numerica Avanzata – CeSNA
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A nonuniform TFA homogenization technique based on piecewise interpolation functions of the inelastic field

The present research deals with a homogenization technique based on the Transformation Field Analysis (TFA) for the study of heterogeneous composite media characterized by nonlinear response. According to the TFA, the behavior of the representative volume element (RVE) is studied accounting for the nonlinear effects by means of the presence of a uniform inelastic strain distribution in the nonlinear constituent of the heterogeneous material. In order to improve the TFA, the assumption of uniformity of the inelastic strain distribution is removed, so that a nonuniform inelastic strain field, better representing the inelasticity distribution in the composite, is considered. In particular, the inelastic strain is represented as a piecewise linear combination of analytical functions of the spatial variable. The theory, presented in a general framework, can be successfully adopted for deriving the overall constitutive response for a wide range of nonlinear composite materials. The procedure is tailored to investigate the response of composites whose constituents are Shape Memory Alloys (SMA) and materials characterized by plastic behavior.

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Tuesday, November 6, Aula MS1, 11.30
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