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Non-Local Incremental-Secant Mean-Field-Homogenization of Damage-Enhanced Elasto-Plastic Composites.

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An anisotropic gradient–enhanced continuum damage model is herein embedded in a mean–field homogenization (MFH) process for elasto-plastic composites.

The homogenization procedure is based on the newly developed incremental secant mean-field homogenization formulation, for which the residual stress and strain states reached in the phases upon a fictitious elastic unloading are considered as starting point to apply the secant method. The mean stress fields in the phases are then computed using isotropic secant tensors, which are naturally used to define the Linear Comparison–Composite

The resulting multi– scale model is then applied to study the damage process at the meso–scale of laminates, and in particular the damaging of plies in a composite stack. By using the gradient–enhanced continuum damage model, the problem of losing uniqueness upon strain softening is avoided.

Keywords: Non-local, Mean-Field-Homogenization, Composites, Multiscale