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Nonlocal damage modelling in clay/epoxy nanocomposites using a multiscale approach

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Abstract

This study proposed a concurrent multiscale method for modelling damage in clay/epoxy nanocomposites. The method uses a nonlocal damage formulation to regularize the damage model. The multiscale method **used** is based on the Arlequin method which couples two overlapping scales using the Lagrange multipliers method. Since the method blends the energies of two scales in a so called "handshake domain", **then** the spurious wave reflection from the coupling region is minimum. **Hence** the method is appropriate for the current dynamic problem. To show the suitability and accuracy of **the** proposed method, a clay/epoxy nanocomposite beam under dynamic loading is simulated using two different approaches: a full fine scale model and a multiscale model **were employed**. **Also, a** comparison between the results proves that the proposed nonlocal multiscale method can accurately predict the damage phenomena inside the clay/epoxy nanocomposites with **minimal** computational costs. **The method presented here is also applicable to a range of related physical problems.**

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