Homogenization Induced Size Scale Effects in Bimaterial Composites with Plasticity and Damage

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ABSTRACT

In this work, examples of bimaterial microstructures with a ductile and a brittle phase are employed for demonstrating existing links between the fields of homogenization, multiscale methods, generalized continua and strain gradient methods. Introductory, a short overview is provided on each of the aforementioned fields and their possible interconnections found in the literature are discussed. Subsequently, simulation results of structures composed of simple bimaterial unit cells are presented and the physical mechanisms resulting in a macroscopically non-local behaviour are illustrated. In addition, a recently introduced homogenization technique [1,2] is presented that relies on appropriately chosen internal kinematic variables for representing the underlying microstructure accurately. The work is concluded with some remarks on the choice of microstructure tailored internal kinematic variables and its role in achieving efficient and highly realistic representations of materials at scales that involve size effects.

REFERENCES

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