Discrete Probabilistic Modelling of Damage and Adhesion

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The continuous and deterministic view inherent to continuum mechanics can be substituted by a probabilistic approach, which is generally achieved for brittle materials by the weakest link model, and its generalizations. Discrete probabilistic modelling of interfaces are elaborated, considering the impact of heterogeneities on the macroscopic behaviour. In the present contribution, we enlarge the so-called Daniels model, which consists of a bundle of parallel fibbers, first considering various probability laws for the distribution of the rupture thresholds. The rheology of the bundle is further considered, whereby a viscous behaviour of the fibber bundle interface is introduced. We exhibit a bifurcation behaviour in different configurations, such as adhesively bonded joints, considering different histories of the applied load. The progressive degradation of the fibber bundle is further modeled assigning a Scott Blair type behaviour to the interface; the response of the recursive block is evaluated by an electrical analogy.

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