A UNIFIED NON-LINEAR ENERGY DISSIPATION-BASED PLASTIC-DAMAGE MODEL FOR CYCLIC LOADING

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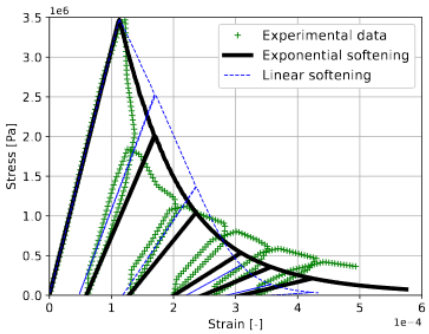
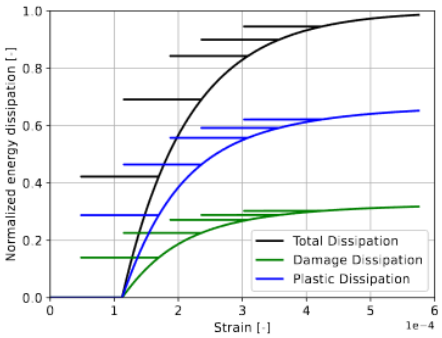
A new energy-dissipation-based rate-independent constitutive law within the framework of elasto-plasticity coupled with damage[1,2,3] is proposed. With this methodology, the inelastic strains and the stiffness degradation exhibited by quasi-brittle materials under monotonic or cyclic loading conditions are taken into account. A wide variety of hardening/softening laws on the stress-strain relationship are described and considered for the novel normalized plastic-damage energy dissipation internal variable.

This normalized internal variable allows the model to be independent on the sign of the load and dissipate different fracture energies (tensile, compressive and potentially shear) in a natural way. Several numerical examples are presented in order to ensure the efficiency and validity of the proposed model for simulating the non-linear behaviour of quasi-brittle materials under monotonic and cyclic loading.

Some numerical aspects of the implemented algorithm and the return mapping procedure are also described in detail and discussed.



(a) Tensile cyclic test



(a) Tensile cyclic test

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