A fractional model of finite viscoelasto-plasticity including damage through the Phase Field technique

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This work presents a monophasic modelling framework designed to describe the behavior of viscoelastic materials subjected to damage and plasticity in the finite deformation regime.

The model implements a multiplicative decomposition of the material's deformation gradient tensor into a viscoelastic, plastic and damage part [1]. The tensors associated with the viscoelastic and plastic distortions are computed, rather than being prescribed *a priori*, alongside the requirement that the related processes must be isochoric [2]. Damage distortions are prescribed from the outset assuming an isotropic behavior [1] and coupled to the Phase Field, intended as the *damage variable*.

The Phase Field is included into the constitutive framework via a grade-one model, thereby ensuring that the considered constitutive laws depend on the gradient of the Phase Field. Moreover, the model addresses viscoelasticity by assuming that the relation between mechanical stress and its associated strain rate be fractional in time [3].

The governing boundary-value problem and its computational background are outlined, followed by the presentation of relevant numerical results.

References

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