Material Sink Approach to Fracture Modelling

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ABSTRACT

Bulk cracks are created by massive breakage of molecular or atomic bonds. The latter, in its turn, leads to the highly localized loss of material, which is the reason why even closed cracks are visible by a naked eye. Thus, fracture can be interpreted as the local material sink. Mass conservation is violated locally in the area of material failure. We consider a theoretical formulation of the coupled mass and momenta balance equations for a description of fracture [1, 2]. Our focus is on brittle fracture of soft materials and we propose a finite strain hyperelastic thermodynamic framework for the coupled mass-flow-elastic boundary value problem. The attractiveness of the proposed framework as compared to the traditional continuum damage theories is that no internal parameters (like damage variables, phase fields etc.) are used while the regularization of the failure localization is provided by the physically sound law of mass balance.

REFERENCES

[1] K.Y. Volokh “Fracture as a material sink”, *Materials Theory* **1**:3 (2017)

[2] A. Faye, Y. Lev, K.Y. Volokh “The effect of local inertia around the crack tip in dynamic fracture”, *submitted* (2019)