Lower semicontinuity results in SBD and Barenblatt's theory

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Abstract: We consider surface energies framed in the Barenblatt's theory of Fracture Mechanics, and which take into account the fractures appearing under the regime of linearized elasticity. These surface integrals the "solid" region, the second term is a surface term, which represent the energy dissipated in the fracture process. They may have explicit dependence on the normal component of the opening of the fracture and include a constraint which prevents infinitesimal interpenetration.

In details, the problems concern energy minimization for brittle solids where there is explicit dependence on the detachment or dependence both on the jump of the deformation and on the normal unit vector to the unknown crack site. From the mathematical view point they consist of looking for sufficient conditions for lower semicontinuity in the space of special functions of bounded deformation, of surface integrands depending on the real amplitude of the jump or more generally on the pair (jump of the deformation, normal to the jump set), i.e.

$$\int_{J_u} \phi([u] \cdot \nu_u) d\mathcal{H}^{N-1} \ , \ [u] \cdot \nu_u \geq 0 \ \mathcal{H}^{N-1} - \text{ a. e. on } J_u. \tag{1}$$

and

$$\int_{J_u} \Psi([u], \nu_u) d\mathcal{H}^{N-1} \ , \ [u] \cdot \nu_u \geq 0 \ \mathcal{H}^{N-1} - \text{ a. e. on } J_u. \tag{2}$$

Characterizations of the considered integrands, in terms of suitable 'convexity' conditions, are also given and a comparison between the two classes in (**??**) and (**??**) has been performed.