

Concentration versus oscillation effects in brittle damage

Filip Rindler

Mathematics Institute
University of Warwick
U.K.

e-mail: F.Rindler@warwick.ac.uk

In the theory of brittle damage in the so-called “brutal” regime, a linearly elastic material can exist in one of two states: a damaged state, for which the energy is described via a symmetric fourth-order “weak” elasticity (Hooke) tensor or an undamaged state with a “strong” elasticity tensor. Damage is a typical inelastic phenomenon described by means of an internal variable, which here is given as the indicator function of the damaged region. The dissipational energy is taken as proportional to the damaged volume. In this talk I will discuss the variational limit as the damaged zone concentrates into a set of zero volume and, at the same time and to the same order, the stiffness of the damaged material becomes small. We explicitly identify the Gamma-limit in two and three dimensions for isotropic Hooke tensors. The expression of the limit effective energy turns out to be of Hencky plasticity type. The analysis is complicated by the fact that homogenization effects interact with singularity formation in maps of bounded deformation in a nontrivial way. This is joint work with J.F. Babadjian and F. Iurlano.