A QUASISTATIC APPROACH TO ACOUSTIC EMISSION IN FRACTURE

Clara B. Picallo[1,2], Juan M. López[1]

(1) Instituto de Física de Cantabria (IFCA), CSIC-UC, E-39005 Santander
(2) Departamento de Física Moderna, Universidad de Cantabria, Avda. Los Castros, E-39005 Santander

Monitorization of acoustic emission is one of the most widespread ways to analyse fracture experimentally [1]. Acoustic emission (AE) appears due to the release of energy -elastic energy, dislocations or friction- during the fracture process. The AE signal is an example of "crackling noise" and it is characterized by the appearence of scaling laws in the energy of the acoustic events and in the intervals between them, analogous respectively to the Gutenberg-Richter and Omori laws observed in earthquakes.
Finding a simple model that reproduces what is observed in experiments is one of the aims of today's physics of fracture. Here we study the energy release during the fracture of 2D disordered materials within the framework of the random fuse model, a quasistatic lattice model where an analogous scalar electrical problem is solved. In this model, when the current through a fuse exceeds its rupture threshold, it burns becoming an insulator.
In our study, qualitative agreement with AE experiments is obtained taking into account only the elastic energy dissipated each time a fuse burns and analyzing its spatial distribution and its temporal and spectral characteristics. Large fuse networks have been used thanks to a recent evolution algorithm [2] that reduces substantially the computational cost involved in solving the Kirchhoff equations in the network.

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[2] P. K. V. V. Nukala and S. Simunovic, J. Phys. A **36**, 11403 (2003)