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Stability and roughness of crack paths in 2D heterogeneous brittle materials EYTAN KATZAV, MOKHTAR ADDA-BEDIA, BERNARD DERRIDA, LPS - Ecole Normale Superieure, Paris — We present a recent study on the stability of propagating cracks in heterogeneous two-dimensional brittle materials and on the roughness of the surfaces created by this irreversible process. We introduce a stochastic model describing the propagation of the crack tip based on an elastostatic description of crack growth in the framework of linear elastic fracture mechanics. The model recovers the stability of straight cracks and allows for the study of the roughening of fracture surfaces. We show that in a certain limit, the problem becomes exactly solvable and yields analytic predictions for the power spectrum of the paths. This result suggests a surprising alternative to the conventional power law analysis often used in the analysis of experimental data and thus calls for a revised interpretation of the experimental results.

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