Scaling for the Coalescence of Microfractures Before Breakdown

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We study the behavior of fracture in disordered systems close to the breakdown point. We simulate numerically both scalar (resistor network) and vectorial (spring network) models with threshold disorder, driven at constant current and stress rate respectively. We analyze the scaling of the susceptibility and the cluster size close to the breakdown. We observe avalanche behavior and clustering of the cracks. We find that the scaling exponents are consistent with those found close to a mean-field spinodal and present analogies between the coalescence of microfractures and the coalescence of droplets in a metastable magnetic system. Finally, we discuss different experimental conditions and some possible theoretical interpretations of the results.

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