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Influence of temperature in interfacial crack propagation in a heterogeneous medium

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We study the evolution of crack fronts during stable interfacial fracture experiments in a heterogeneous quasi-brittle material under constant loading rates and during long relaxation tests. Transparency of the material (PMMA) allows to track continuously the front position and to relate its evolution to the energy release rate. We compare these observations to a depinning model in disordered media that includes both the role of temperature and long range elastic interactions. The numerical scheme is based on a continuous description in time of a local activated energy process with an Arrhenius law and a non-local kernel in space. We show that our model renders, at the macroscopic scale, the experimental strain response both at constant loading rate and during relaxation test. At the microscopic scale, power law distributions of the crack velocity are also successfully compared for various experimental disorders. Spatial correlations of the toughness fluctuations are shown to be important for reproducing quantitatively the observed morphology of the crack front. We also show that the cross-over in the front roughness scaling is related to temperature.