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Thermally Activated Avalanches in Twinned Crystals IDO

REGEV, Los Alamos National Laboratory, XIANGDONG DING, Xi'an Jiaotong University, TURAB LOOKMAN, Los Alamos National Laboratory — In previous work it was shown that the power-spectrum of the energy release in a twinned crystal under deformation, exhibits a transition from a low-temperature power-law to a high temperature activated dynamics. In this work we provide a statistical mechanics explanation to this behavior based on the understanding that the origin of the power-law behavior stems from a pattern of vertical twins that forms at the onset of yield, and serves as pinning sites to the motion of the (horizontal) twins. The transition to activated behavior is explained by a master equation based on a “trap model.”

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