

Criticality and fluctuations in discrete dislocation dynamics

Friday, March 10, 2017 9:30 AM (45 minutes)

The character of the crackling noise and intermittent response of dislocation systems remains a partly unresolved problem. Partly this has been charted by the use of extensive Discrete Dislocation Dynamics (DDD) simulations. 2D studies [1,2,3,4] show that these systems exhibit glassy response and extensive criticality even at zero stresses, while introducing impurities such as solutes on changes the phase diagram and leads to additional phases and complexity [2,4]. In 3D, the phenomenology seems similar to 2D [5], in that an extended critical phase down to zero applied stress is found. One of the research directions is to consider the impact of “disorder” such as precipitates [6] and prismatic loops on plasticity in these systems [7].

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