

Abstract Submitted
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Saddle node scaling on approach to dislocation nucleation

AKANKSHA GARG, ASAD HASAN, CRAIG MALONEY, Carnegie Mellon University — We study the process of dislocation nucleation in a perfect 2D hexagonal crystal under nano-indentation loading in a numerical model using energy minimization techniques and analysis of the energy eigenmodes. The nucleation event takes the form of a saddle-node catastrophe and is governed by associated scaling laws. In particular, on approach to nucleation, a single energy eigenmode descends through the spectrum and its eigenvalue vanishes as the square root of the distance to the nucleation point. The velocity of the system shows the same scaling behavior, and its normal mode decomposition demonstrates that it is dominated by the critical mode responsible for nucleation.

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