Abstract Submitted
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Elastic Stiffness of Grain Boundary Scars and Dislocation Dynamics HOMIN SHIN, MARK BOWICK, Syracuse University — We analytically calculate the stiffness of finite-length grain boundaries (scars) on a spherical crystal within the continuum elasticity theory. The scar is composed of an isolated disclination with +1 topological charge together with a finite number of dislocations. We determine the elastic free energy of a single finite-grain boundary scar by considering interacting defects, such as Disclination-Disclination (D-D), Disclination-dislocation (D-d), and dislocation-dislocation (d-d). The harmonic potential binding dislocations to the scar is obtained by determining the free energy of a single dislocation perturbed away from its equilibrium position. The elastic spring constants so obtained are compared to experimental data on dislocation dynamics [1]. We conclude with some comments on interstitial dynamics. [1] Lipowsky, P., Bowick, M. J., Meinke, J. H., Nelson, D. R. and Bausch, A. R. Nature Mater. 4, 407-411 (2005).

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