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Direct Visualization of Dislocation Dynamics in Grain Boundary Scars MARK BOWICK, Syracuse University, PETER LIPOWSKY, ANDREAS BAUSCH, Technical University of Munich, JAN MEINKE, Syracuse University, DAVID NELSON, Harvard University, BB COLLABORATION — We describe the structural features and the equilibrium dynamics of micron-scale spherical crystals formed by polystyrene particles adsorbed on the surface of a spherical water droplet. The ground state of sufficiently large crystals possesses finite-length grain boundaries (scars). The elastic response of the crystal is measured by single-particle diffusion and the fluctuations of individual dislocations about their equilibrium positions within a scar followed. We observed rapid dislocation glide with fluctuations over the barriers separating one local Peierls minimum from the next and rather weak binding of dislocations to their associated scars. The long-distance (renormalized) dislocation diffusion glide constant is extracted directly from the experimental data and is found to be moderately faster than single particle diffusion. We also determined the parameters of the Peierls potential induced by the underlying crystalline lattice.

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