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Atomistic Dislocation Dynamics in Phase Field Crystals: Long Time Scale Properties JOEL BERRY, McGill University, K.R. ELDER, Oakland University, MARTIN GRANT, McGill University — The fundamental dislocation processes of glide, climb, and annihilation are studied on diffusive time scales within the framework of a continuum field theory, the Phase Field Crystals (PFC) model. Glide and climb are examined for single edge dislocations subjected to shear and compressive strain, respectively, in a two dimensional hexagonal lattice. It is shown that the natural features of these processes are reproduced without any explicit consideration of elasticity theory or ad hoc construction of microscopic Peierls potentials. Particular attention is paid to the Peierls barrier for dislocation glide/climb and the ensuing dynamic behavior as functions of strain rate, temperature, and dislocation density. It is shown that the dynamics are accurately described by simple viscous motion equations for an overdamped point mass, where the dislocation mobility is the only adjustable parameter. The critical distance for the annihilation of two edge dislocations as a function of separation angle is also presented.

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