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Studies of the Dislocation Glass GERGELY ZIMANYI, UC Davis, BOTOND BAKO, ISTVAN GROMA, GEZA GYORGYI, Eotvos Lorand University, Budapest, Hungary — We report the large scale simulations of 2D dislocation systems with overdamped dynamics. 40,000-1,000,000 dislocations were studied with a combination of coarse graining, Fast Fourier Transform and stochastic methods. Both glide and climb processes were considered, as well as the local rotation of crystal axes. Simulations were performed at zero and finite temperatures, with and without dislocation annihilation. When climb processes were included, the system exhibited the formation of dislocation cells/patterns even in equilibrium, without the application of shear. This is in close correspondence with recent experiments on GaAs by P. Rudolph et al. (2005). The distribution function of cell sizes can exhibit a fractal dimension. At long times the system shows glassy dynamics. In particular, aging was observed through the waiting time dependence of the correlations and the effective diffusion. In certain parameter ranges the formation of cells leads to an initial exponential decay of correlations. This is followed by the growth of cells, generating a power law temporal decay in the long time domain. Data for both time domains and for all waiting times can be collapsed onto a single master curve when a t/tw scaling is applied.

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