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Glassy Dislocation Relaxation in Colloidal Peanut Crystals SHARON GERBODE, DESMOND ONG, UMANG AGARWAL, CHEKESHA LIDDELL, FERNANDO ESCOBEDO, ITAI COHEN, Cornell University — Previous studies of dislocations in crystals of colloidal dimers have revealed unusual restrictions on dislocation glide. In the current study, we induce defect formation in such crystals using an optically manipulated spherical intruder particle dragged through an otherwise pure dimer crystal grain. We find that the relaxation response of the perturbed crystal changes as a function of the size of the grain. For small grains, the crystal relaxes via unrestricted dislocation glide, while in larger grains, other slower relaxation mechanisms are utilized. Furthermore, we have uncovered a two-stage defect relaxation process in crystals of dimers, reminiscent of relaxation in glassy systems, in which an initial fast glide response is followed by a slower relaxation process where dislocations hop between caged configurations. We find that the relaxation decay of dislocations is consistent with the combination of a fast exponential decay followed by a slow logarithmic decay characterized by a timescale 5 orders of magnitude longer than that of the exponential decay. Together these results reveal an interesting new class of materials possessing crystalline order but whose defects are characterized by glassy behavior.

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