

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Restricted Defect Dynamics in Colloidal Peanut Crystals

SHARON GERBODE, Physics - Cornell University, STEPHANIE LEE, Materials Science and Engineering - Cornell University, BETTINA JOHN, Chemical Engineering - Cornell University, ANGIE WOLFGANG, Physics - Cornell University, CHAKESHA LIDDELL, Materials Science and Engineering - Cornell University, FERNANDO ESCOBEDO, Chemical Engineering - Cornell University, ITAI COHEN, Physics - Cornell University — We report that monolayers of hard peanut-shaped colloidal particles consisting of two connected spherical lobes order into a crystalline phase at high area fractions. In this “lobe- close-packed” (LCP) crystal, the peanut particle lobes occupy triangular lattice sites, much like close-packed spheres, while the connections between lobe pairs are randomly oriented, uniformly populating the three crystalline directions of the underlying lattice. Using optical microscopy, we directly observe defect nucleation and dynamics in sheared LCP crystals. We find that many particle configurations form obstacles blocking dislocation glide. Consequently, in stark contrast to colloidal monolayers of close-packed spheres, single dislocation pair nucleation is not the only significant energetic barrier to relieving an imposed shear strain. Dislocation propagation beyond such obstructions can proceed only through additional mechanisms such as dislocation reactions. We discuss the implications of such restricted defect mobility for the plasticity of LCP crystals.

APS Abstracts

Date submitted: 14 Dec 2007

Electronic form version 1.4