Abstract Submitted
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Packing Cheerios: Simulation studies of torus-shaped hard particles[1] ANDREW KONYA, ROBIN SELINGER, Kent State University — We perform simulation studies of hard torus-shaped particles under compression or in granular flow. A major challenge in performing simulations of non-spherical hard particles is determination of possible overlap between particle pairs. To simplify this calculation, we model a torus particle as an assembly of overlapping hard spheres arranged in a ring, and implement GPU acceleration to create an efficient Monte Carlo algorithm. For particles shaped approximately like Cheerios, with major radius R=1 and minor radius r=0.6, the hexagonal columnar crystal structure has packing fraction of about 2/3, but—as easy to observe in your cereal box—the system is easily trapped in a glassy disordered state. Preliminary simulation studies of the disordered state formed via rapid compression show short-range orientational correlations in which neighboring particles are either parallel or at right angles. We also examine structures that form when particles rain down onto a flat surface. Results are compared with the known liquid crystal phases of oblate ellipsoids and experiments on discotic colloidal phases.

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