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Modeling the Collective Behavior of Soft Colloidal Particles
ARTEM LEVANDOVSKY, ALEXANDER ALEXEEV, ANNA BALAZS, University of Pittsburgh — Recent developments in the fabrication of soft colloids open up the possibility for designing new, responsive materials that are composed of these colloidal particles. Such colloidal systems can have properties tailored not only to reproduce molecular systems on the nano- and micro- scale, but also show novel collective behavior. This is due to the fact that the range of interactions between the particles can be significantly smaller than the size of particle. This is in contrast to certain molecular systems. A significant challenge here is to identify the key parameters that control the system dynamics and the underlying physical mechanisms. By numerical modeling, we study materials composed of soft particles that are closely packed into an amorphous state. We focus on the dynamical behavior and mechanical properties of such material, which behaves like a soft elastic solid at low stress but flows like a viscous liquid at stresses above the critical yielding value. Such behavior governs materials as different as pastes, foams, and biological tissues.

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