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Self organization and jamming in magnetic photoelastic particles[1]
MEREDITH COX, Durham Academy Upper School, JONATHAN BARES, DONG WANG, ROBERT BEHRINGER, Duke University — Many experimental studies of simple particles in granular systems have been conducted, but the behavior of complex particles in such systems has not been addressed. There has been a growing interest in functionalized microparticles, and the study of these complex particles may reveal interesting analogues between micro- and macroparticles. We perform experiments to investigate magnetic particles in a 2D granular material close to the jamming transition. We incrementally compress photoelastic particles containing magnets and image the interparticle forces in each compression using a photoelastic technique. To track the orientation of individual particles, we draw UV-visible bars on each particle and image each compression of the system under ultraviolet light. We repeat the experimental procedure using varying ratios of magnetic to nonmagnetic particles from 0% magnetic to 100% magnetic. By using custom software to resolve particle deformations, we extract particle contact forces and demonstrate that as the concentration of nonmagnetic particles grows, the rate of increase of pressure with strain also grows.

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