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Effect of Particle Shape on Stress-Strain Measurements of Granular Materials[1] SARA BERRY, TED BRZINSKI, KAREN DANIELS, North Carolina State Univ — Granular materials are composed of many discrete athermal particles, which exhibit liquid like properties below some critical packing fraction and solid like properties, such as yield stress, above. Physics research has generally considered granular materials composed of spherical grains. Most natural grains are not spherical, but rather odd shapes that often break symmetries and exhibit various contact modes. Therefore, in addition to circles, we study quasi-2D elliptical, pentagonal, and star-shaped particles. This set of particles were chosen to break rotational symmetry, introduces point-face and face-face contacts, and even interlock. We measure the yield stress as a function of packing fraction for each type of grains. Our experiment consists of 820 particles floating on an air table, compressed bi-axially. Utilizing force sensors along the walls and an overhead camera, we are able to determine the bulk pressure and the packing fraction. We find that the critical packing fraction is shape dependent. However, this shape dependence can be scaled out of the pressure versus packing fraction relation.

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