Abstract Submitted
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Stability and Structure of Star-Shape Granules[1] YUCHEN ZHAO, JONATHAN BARES[2], Duke Univ., Department of Physics, NC, KEVIN LIU, Julia R. Masterman Laboratory and Demonstration School, PA, MATTHEW ZHENG, North Carolina School of Science and Mathematics, NC, KAROLA DIERICHS, ACHIM MENGES, Institute for Computational Design, University of Stuttgart, Stuttgart, Germany, ROBERT BEHRINGER, Duke Univ., Department of Physics, NC — Columns made of convex noncohesive grains like sand collapse after being released from a confining container. While various architectures built by concave grains are stable. We explore why these structures are stable, and how stable they can be. We performed experiments by randomly pouring identical star-shape particles into hollow cylinders resting on glass or a roughened base, and then observed how stable these granular columns were after carefully lifting the cylinders. We used particles that are made of acrylics and have six $9\,mm$ arms, which extend symmetrically in xyz directions. We investigated the probability of creating a stable column and other mechanical stability aspects. We define r as the weight fraction of particles that fall out of the column after the confining cylinder is removed. r gradually increases as the column height increases, or the column diameter decreases. We found high column stability when the inter-particle friction was greater. We also explored experiment conditions such as initial vibration of columns when they were confined and loading on the top. In order to understand the inner structure leading to stability, we obtained 3D CT reconstruction data of stable columns. We will discuss coordination number and orientation, etc.

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