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Experiments on Random Packings of Ellipsoids WEINING MAN, ALEKSANDAR DONEV, FRANK STILLINGER, MATTHEW SULLIVAN, WILLIAM RUSSEL, Princeton University, DAVID HEEGER, SOUHIL INATI, New York University, SALVATORE TORQUATO, PAUL CHAIKIN, Princeton University — Recent simulations indicate that ellipsoids can randomly pack more densely than spheres and, remarkably, for axes ratios near 1.25:1:0.8 can approach the densest crystal packing (FCC) of spheres, with packing fraction 74%. Here we fabricated about 1000 such ellipsoids and measured their packing properties in a number of different containers and using a variety of conventional and novel techniques. We find excellent agreement with the previous simulations and with new simulations for the density profile in finite size systems. We introduce a new method, using a spherical container and measuring the volume of fluid needed to fill the voids as a function of the fluid level, which greatly reduces surface effects and enables the determination of the bulk or core packing fraction $\phi_{bulk}$for rather small systems. This technique should prove useful for many granular material and packing studies. We also confirm these measurements with magnetic resonance imaging (MRI) studies which provide the most direct method in the case of non-metallic particles. From our experiments, we find the random jammed packing faction ϕ, as ϕ_{sphere}=.635 ± .005, $\phi_{m\&m's}$=.700 ± .005, $\phi_{ellipsoid}$=.739±.005 for our 2.344:1.875:1.5 cm ellipsoids.

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