Spring 2016 Joint Colloquium
Materials Department & Materials Research Laboratory

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Effect of geometry of 2D-dumbbells on the structure of random jammed packing

Particle shape is one of the major parameters governing the structure in hard-particle systems. A 2D-dumbbell, which consists of a pair of binary disks connected to each other, has two geometrical characteristics: the existence of a bond and asymmetry due to a size difference. We investigate the effects of the geometry of 2D-dumbbells on packing structure at an air-water interface under short-range attractions, varying the area fraction j of particles. We observe that the short-range attraction between particles due to capillary interaction does not affect the local structure at maximally random jammed (MRJ) packing fraction, although the systems at low j exhibit characteristic structure of attractive particle systems.

We investigate the influence of a rigid bond on the packing structure by comparing 2D-dumbbell systems with binary-disk systems and the effects of the asymmetry by controlling the diameter ratio (g) of the small and large disks of a dumbbell. First, we find that the existence of a bond restricts local segregations between similar kinds of disks, so the phase-separated glass states are forbidden contrary to binary-disk systems. Second, we observe that varying g causes a structural order-disorder-order change at high j. While crystalline structures of disks (g=0) and symmetric dimers (g=1) are similar in local contacting and ordering behaviors despite the shape difference, amorphous structures of asymmetric dimers (g=0.3, 0.5, and 0.7) exhibit distinct features depending on g .

Bio

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https://college.gist.ac.kr/profile/basic_kmw.html

Hosted by Ram Seshadri