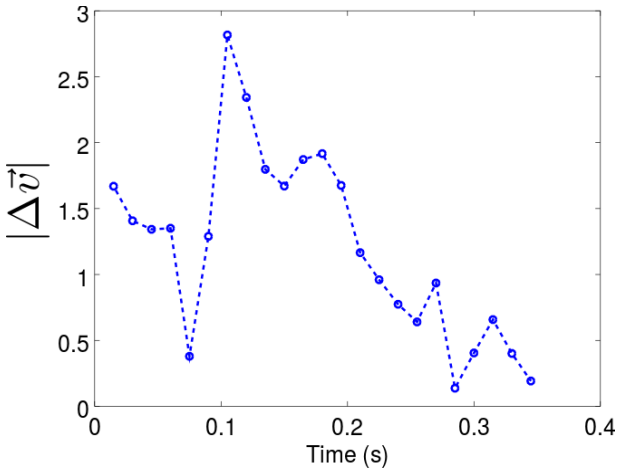
Electronic Supplementary Material (ESI) for Soft Matter.

Video Captions for Supplementary Videos:

Video1: The dynamics of two systems of spinners are shown. The particles are randomly selected from P2 (See Table 1 in main text). The data is captured at 67 fps and the video is shown 3.3 times slower than real time (video speed is 20 fps). Left: Packing fraction is 0.1. Right: Packing fraction is 0.4.

Video2: An example of hyperelastic collision. The particles jump off with a higher relative speed after the collision. The relative speed of the particles are tracked in the plot below (unit of speed is particle diameter per second). As seen, the coefficient of restitution is approximately 2 for this collision. The data is taken at 67 fps and the video is shown 10 times slower than real time (video speed is 6.7 fps).



Video3: The dynamics of particles (P3) in tilted platform. The video is speed is real time. The platform is tilted to the right, hence created an effective gravity towards the right side of the sample. A row of bi-sized steel bars is placed at the right edge of the container so that they create a rough surface to avoid crystallization.

Video4: Dynamics of spinners for mixtures of CW and CCW (mirror image) particles. The CCW particles are marked with bright color at their rims for identification. The data is taken at 6.7 fps, and the video is sped up 3 times compared to real time. 50 particles of each species are placed in the sample which results in packing fraction of 0.6. Short-lived segregated regions form and disappear throughout the experiment.

Video5: Dynamics of spinners with added geometrical friction. The geometrical friction is provided by eight small circular-shaped bumps printed at the edges of the older design. The packing fraction is 0.34. The data is taken at 67 fps and the video is slowed 3 times than real time (video speed is 20 fps). As seen, stable solid regions form in co-existence with the gas phase, which may dissolve and reform at the region boundaries.