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Aggregation of athermal particles induced by capillarity
MICHAEL BERHANU, ARSHAD KUDROLLI, Department of Physics, Clark University, Worcester, MA 01610. — Aggregation of cohesive particles floating in a medium is a very broad physical phenomena occurring in colloidal systems, soot particles, and intergalactic dust under gravitation. We investigate the geometrically constrained dynamics of aggregation with new experiments using floating spheres at the air-liquid interface. A short range attractive force can be induced by careful choice of buoyancy and capillarity to create self-assembled particle structures which can be tracked by imaging. First, the particles are placed randomly at the interface, and then aggregation is induced by smoothly decreasing the area of the interface which causes the particles to come within the attractive force range caused by capillarity. We measure the area fraction at which the connectivity and rigidity percolation transitions are observed and further characterize the aggregates with two-point correlation functions. We then compare and contrast our results with gelation and jamming transitions reported with colloids and granular matter. Finally, we study the reverse phenomena, where we probe the response of the aggregate to an increase in interface area.

Michael Berhanu
Department of Physics, Clark University, Worcester, MA 01610.

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