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The Role of the Stokes Number, the Capillary Number, and the Centrifugal Number in Oblique Wetted Particle Collisions CARLY DONAHUE, ROBERT DAVIS, CHRISTINE HRENYA, University of Colorado, Boulder — A plethora of systems that contain solid particles coated in a liquid layer are found in nature (e.g. avalanches, pollution) and in industry (e.g. granulation, particle filtration). Previous micro-level studies of wetted collisions have been limited to normal particle-particle collisions and normal and oblique particle-wall collisions. However, for a complete understanding, a study of oblique particle-particle collisions is crucial. In the work presented here, a combination of experiments and theory are used to identify the roles of capillary and centrifugal forces in these collisions at low Reynolds number. Surprisingly, even when the capillary number is high (ratio of lubrication to capillary forces), capillary forces play an essential role in agglomeration vs. de-agglomeration. Moreover, another dimensionless number is identified to characterize the relative importance of the centrifugal forces to the capillary forces, namely the Centrifugal number, which together with the Stokes number characterizes the regime map of outcomes. This work provides the foundation for simulations of many-particle systems.

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