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Head-on collision of viscous drops ROBERT SCHROLL, Physics Department and the James Franck Institute, The University of Chicago, CHRISTOPHE JOSSERAND, STEPHANE ZALESKI, CRNS and Universite Pierre et Marie Curie , WENDY ZHANG, Physics Department and the James Franck Institute, The University of Chicago — When a liquid drop hits a solid wall at several m/s, the no-slip boundary condition at the wall causes a viscous boundary layer to develop. Numerical results on the impact of a viscous liquid drop reveal that the presence of this viscous boundary layer causes the thin liquid sheet ejected by impact to attain a pancake shape, characterized by a uniform thickness everywhere except at the rim. Here we examine a scenario where the viscous boundary layer is absent and show that, consistent with our expectation from solid-wall impact, the ejected sheet has a different shape. Specifically we simulate head-on collision of two viscous liquid drops of equal size. Air effects are reduced to a level where they are insignificant. Because the collision plane corresponds to essentially a free-stress surface, the viscous boundary layer is absent. Consistent with this absence, we find that the thin liquid sheet ejected by the collision does not evolve towards a pancake shape, but instead thins continuously with distance from the collision center. Reducing the strength of surface tension increases the radial extent of the sheet at a given time after collision.

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