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A New Approach to Modeling Drop-Pair Collisions: Predicting the Outcome through a Fluidic-Mechanical System Analogy PAUL VAN NOORDT, CARLOS HIDROVO, The University of Texas at Austin — The study of microfluidics has proven to be of great value in many engineering and scientific applications. Because of the small scales involved, microfluidics requires only small sample sizes, which can result in shorter reaction and analysis times, relatively cheap costs, and little waste. In this study, we investigate the process of two drops colliding head-on in order to gain a better understanding of the mechanisms that govern the outcome of the collision. The relationship between kinetic and surface energy of the colliding drops is considered, as is the viscosity of the intervening gaseous medium, as factors that govern the outcome. The collision process is modeled by a squeeze-flow problem involving both planar and non-planar geometry, with attention given to the deformation of the interacting surfaces. Based on the nature of the collision process, an analogy is made between the fluidic systems of colliding liquid bodies and a mechanical mass-spring-damper system. Examination of the analogous mechanical system yields the derivation of an effective damping ratio, ζ^*, which is used to predict the outcome of the drop-drop collision. Predictions made by utilizing the effective damping ratio are then compared to numerical results and experimental data found in the literature.

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