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Coalescence of Low-Viscosity Liquids J.D. PAULSEN, S.R. NAGEL, James Franck Institute, University of Chicago — When two fluid drops come into contact, a dramatic topological transformation occurs as the drops coalesce. The speed and geometry of this finite-time singularity make it difficult to study optically, so we use an electrical method to probe coalescence at early times.[1,2] For low-viscosity liquids, we measure a resistance that varies as t^{-1} at early times and as $t^{-1/2}$ at late times. In the inviscid case, these power laws have been interpreted with a model in which the drops coalesce at a slightly deformed interface.[2] In order to test further predictions of this model, we study coalescence at faster rates than previously attainable. We have previously shown that the crossover time between these power laws increases with viscosity, depends weakly on the surrounding gas pressure, but does not depend on the weight of the gas.[3] We further explore outer-fluid effects by replacing the ambient gas with a liquid, showing that the crossover time is delayed with increasing outer-fluid viscosity.

[1]J. C. Burton, J. E. Rutledge, and P. Taborek, Phys. Rev. Lett. **92**, 244505 (2004).
[2]S. C. Case and S. R. Nagel, Phys. Rev. Lett. **100**, 084503 (2008).
[3]J. D. Paulsen, J. C. Burton, and S. R. Nagel, DCMP 2009.

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