Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Coalescence of Spreading Droplets on a Wettable Substrate W.D. RISTENPART, Division of Engineering and Applied Science, Harvard University, P.N. MCCALLA, Dept. of Physics, Morgan State University, H.A. STONE, Division of Engineering and Applied Science, Harvard University — We investigate experimentally the coalescence dynamics of two slowly spreading droplets on a highly wettable substrate. Upon contact, surface tension drives a rapid motion perpendicular to the line of centers that joins the drops and lowers the total surface area. The coalescence behavior is characterized by the time-dependent width w_m of the growing meniscus bridge between the two drops. We find that the growth rate of w_m is always viscously dominated and at early times exhibits power-law-like behavior wherein $w_m \sim t^{0.7\pm0.1}$. Moreover, the growth rate is highly sensitive to both the radii and heights of the droplets at contact. This feature differs significantly from the behavior of freely suspended droplets, in which the coalescence growth rate depends only weakly on the droplet size. We present scaling arguments that accord with the experimental observations.

Howard Stone
Division of Engineering and Applied Science, Harvard University

Date submitted: 10 Aug 2005 Electronic form version 1.4