

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**Effect of AC and DC electric fields on the residence time of coalescing drops** ALEKSANDRA LUKYANETS, H. PIROUZ KAVEHPOUR, Mech. and Aero. Eng., UCLA — The residence time of de-ionized water droplets undergoing coalescence at a planar silicon oil/water interface under AC and DC electric fields is investigated with the aid of high-speed digital photography. We show that the residence time is composed of two sequential stages, which are dominated by deformation and drainage, respectively. Previously developed models predict that residence time occurs in a single stage that is dependent singularly on the magnitude of the electric field; our experiments, however, show that the frequency is also important. In the first stage, the underside of the droplet begins to deform as soon as the electric field in the gap between the droplet and fluid bulk reaches a critical value; although this value is constant for any set of experimental parameters, the first stage residence time should be frequency dependent, as is shown in our experiments. In the second stage, the residence time is dependent only on the drainage of the interfacial fluid film, and thus is inversely proportional to the strength of the electric field and independent of frequency; our results for the second stage are in good agreement with the previously developed model.

Aleksandra Lukyanets  
UCLA

Date submitted: 01 Aug 2008

Electronic form version 1.4