Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Numerical Simulations of Electrostatically Induced Aggregation and Coalescence in Polydisperse Emulsions G.R. MAGILL, W.D. RISTENPART, Dept. Chem. Engr. & Mat. Sci., Univ. California at Davis — Although electrostatic coalescers have long been used to destabilize emulsions of polarizable droplets, the dynamics of droplet aggregation and coalescence remain poorly understood. The aggregation is believed to be primarily driven by dipolar interactions between droplets, suggesting that increasing the electric field strength should increase the rates of aggregation and coalescence. However, recent evidence suggests that coalescence is inhibited above a critical field strength. Here we numerically investigate the dynamics of aggregation and coalescence of polydisperse emulsions. The simulations are based on the point dipole approximation coupled with pseudo hard sphere repulsion at small separations. Two limiting cases are examined in detail: immediate coalescence upon contact, and perfect stability against coalescence. We compare the numerical results to previous experimental work, and we discuss the implications for optimizations of electrostatic coalescers.

William Ristenpart
Dept. Chem. Engr. & Mat. Sci., Univ. California at Davis

Date submitted: 09 Aug 2010 Electronic form version 1.4