Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Electrodynamic behavior and interface instability of double emulsion droplets under high electric field MUHAMMAD SALMAN ABBASI, RYUNGEUN SONG, JAEHOON KIM, JINKEE LEE, Sungkyunkwan University — In this paper, numerical solution of electro-dynamic behavior and interface instability of double emulsion droplet is presented. Level set method and leaky dielectric model coupled with Navier-Stokes equation are used to solve the electrodynamic problem. The method is validated against the theoretical analysis and the simulation results of the other researchers. Double emulsion droplet with inner droplet (core) and outer droplet (shell) phases immersed in continuous phase is subjected to high electric field. Shell/continuous and core/shell interfaces of the droplet undergo prolate-oblate or oblate-prolate deformation depending on the extent of the penetration of electric potential and sense of charge distribution at the interfaces. The deformation of the shell deviates from theory at larger volume fraction of core for oblate-prolate case whereas it follows theory for prolate-oblate case. The interfaces showing oblate-prolate deformation split away at the poles whereas, for prolate-oblate, they split at the equator. The re-union of the two split parts under high electric field results with production of daughter droplet at the core. The large decrease in critical electric field for oblate-prolate case shows their less interface stability at larger volume fraction of core. When the core is eccentric, the electric field drives it towards the shell center or to the shell/continuous interface depending on electrical parameters.

Jinkee Lee
Sungkyunkwan University

Date submitted: 28 Jul 2016 Electronic form version 1.4