Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Conditions for Destabilizing Pickering emulsions using external electric fields KYUHO HWANG, PUSHPENDRA SINGH, NADINE AUBRY — Fine particles are readily adsorbed at fluid-fluid interfaces, and can be used as stabilizers in emulsion technology by preventing adjacent drops from coalescing with each other. We investigate a new technique to destabilize such emulsions, or Pickering emulsions, by applying an external electric field. Experiments show that the latter has two effects: (i) the drops elongate in the direction of the electric field, (ii) the local particle density varies on the drop surface due to the dielectrophoretic (DEP) force acting on the particles. It is shown that the latter is the dominant factor in the destabilization process. Particularly, the success of the method depends on the values of certain dimensionless parameters; specifically, the ratio of the work done by the dielectrophoretic force must be larger than the work done by the buoyant force. Moreover, drops do not coalesce through the regions where the particles locally cluster, whether those are gathered at the poles or at the equator of the drops. As particles move, particle-free openings form on the drop's surface, which allow for adjacent drops to merge. This process takes place even if the particles are fully packed on the drops' surfaces as particles get ejected from the clustering areas due to a buckling phenomenon.

Kyuho Hwang

Date submitted: 07 Aug 2009 Electronic form version 1.4