

Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

The unsteady dynamics of the interface separating two fluids under the influence of electric fields¹ PAYAM SHARIFI, ASGHAR ESMAEELI, Southern Illinois University at Carbondale — Direct Numerical Simulations (DNS) are carried out to study the dynamics of a horizontal interface separating two fluids, having different electrical properties, under the influence of AC and uniform DC electric fields. A front tracking/finite difference scheme is used, in conjunction with Taylor's leaky dielectric model, to solve the governing electrohydrodynamics equations in both fluids at finite Reynolds numbers. The methodology and the code are validated by comparing the results with those of the analytical studies developed at the linear stability limit and it is shown that a very good agreement exists between the two. The results of this study show interesting interface behavior depending on the parameters of the problem. In all the cases considered, the interface becomes unstable beyond a critical voltage and starts to oscillate as it moves toward its (quasi) steady-state shape which is a vertical column pointing from the liquid of higher electric conductivity to the one with a lower conductivity. The shape of the column, however, will vary depending on the individual governing parameters.

¹ORDA-SIUC

Asghar Esmaceli
Southern Illinois University at Carbondale

Date submitted: 04 Aug 2008

Electronic form version 1.4