Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

The role of characteristic parameters in the numerical prediction of droplet radius and contact angle DEBANIK BHATTACHARJEE, HADI NAZARIPOOR, MOHTADA SADRZADEH, Univ of Alberta — Identifying proper characteristic parameters (radius and height of droplet) is the first step toward numerical prediction of droplet base radius and contact angle. In this study, a developed model based on lubrication approximation was applied to examine the effect of characteristic parameters on the droplets spreading over permeable and impermeable substrates. Characteristic radius and height were first evaluated based on two main stages of spreading (initial and equilibrium). The model predictions were then compared with the experimental results available in the literature. The study provides evidence that the selection of characteristic length scales based on both stages provides accurate prediction of the droplet base radius and contact angle. In addition, a modified scaling relation was proposed which relates the theoretical value of the disjoining pressure parameter to its numerical counterpart through the lubrication ratio. This relation enabled accurate prediction of the numerical disjoining pressure (error of 5%). The proposed method greatly simplified the initial guess for the disjoining pressure parameter in the numerical simulation as previously there was no possibility of ascertaining the value.

Debanik Bhattacharjee
Univ of Alberta

Date submitted: 25 Jul 2017 Electronic form version 1.4