Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Two-phase DNS of evaporating drops with 3D phenomena and contact-line dynamics[1] PRASHANT VALLURI, PEDRO J. SÁENZ, KHELLIL SEFIANE, The University of Edinburgh, OMAR K. MATAR, Imperial College London — A novel 3D two-phase model based on the diffuse-interface method is developed to investigate the fully-coupled two-phase dynamics of a sessile drop undergoing evaporation on a heated substrate. General transient advection-diffusion transport equations are implemented to address the conservation of energy and vapour in the gas phase, which also allows the more realistic modelling of interface mass and energy transport based on local conditions. The emphasis of this investigation is on addressing three-dimensional phenomena during evaporation of drops with non-circular contact area. Irregular drops lead to complex interface shapes with intricate contract-angle distributions along the triple line and with a three-dimensional flow which previous axisymmetric approaches cannot show. The versatility of this model also allows the simulation of the more complex case of drops evaporating with a moving contact line. Both constant-angle (CA) and constant-radius (CR) modes of pure evaporation are successfully simulated and validated against experiments.

[1]ThermaPOWER project (EU IRSES-PIRSES GA-2011-294905)

Pedro J. Sáenz
The University of Edinburgh

Date submitted: 29 Jul 2014 Electronic form version 1.4