Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

The effect of vapor diffusion on the evaporation of a sessile droplet on a heated substrate MAHNPRIT JUTLEY, VLADIMIR AJAEV, Southern Methodist University — The study of the physical behavior of sessile droplets on heated substrates is important for many applications, such as the coating of a solid substrate with another material or the spray cooling of electronics. In order to simulate the height evolution of the droplet and its effect on the temperature distribution in the substrate, a model that incorporates the effects of surface tension, gravity, evaporation, thermocapillarity, and disjoining pressure must be used. Due to the physical characteristics of a thin sessile droplet, a lubrication-type model that includes the aforementioned effects can be used. By solving the heat equation in the substrate, the lubrication-type equations in the droplet, and the quasi-steady diffusion equation in the gas phase, we simulate the effect of vapor diffusion on the evaporation of a sessile droplet and its coupling to the pattern of heating in the substrate. By using high-order numerical techniques for solving governing partial differential equations, the height evolution of the droplet, heat distribution in the substrate, and vapor diffusion over time are calculated. Connection of our predictions to recent experimental studies is discussed.

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Date submitted: 01 Aug 2013 Electronic form version 1.4