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The effect of vapor diffusion and unsteady heating on the evolution of a sessile droplet on a substrate MAHNPRIT JUTLEY, VLADIMIR AJAEV, Southern Methodist University — The behavior of a sessile droplet on a heated substrate has been a topic of interest due to its subtle dependencies on the surrounding environmental conditions and its many applications, such as the coating of a solid substrate with another material, the spray cooling of electronics, and DNA microarray technology to name a few. Prediction of the height evolution of a sessile droplet on heated substrate is governed by the unsteady heating of the substrate, the vapor diffusion into the atmosphere above the droplet, and the effects of surface tension, gravity, thermocapillarity, and disjoining pressure. Using lubrication theory and developing coupling relationships between the heat equation in the substrate, height evolution equation of the droplet, and the vapor diffusion equation in the atmosphere, the system of coupled partial differential equations can be derived and solved. Connection of the numerical simulation to experimental studies is discussed.

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