Experimental Investigation of Evaporation Rate of a Droplet on Behavior of the Contact Line

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Extended Abstract

Droplet evaporation has a lot of industrial applications such as spray cooling [1,2], coating technology [3], and evaporative self-assembly [4]. During evaporation of a drop on a solid surface, the maximum evaporation rate occurs at the contact line (i.e. the region where the three phases of liquid, solid, and gas meet). This being said, the mechanism close to the contact line highly controls the process of the evaporation such as the total evaporation time, pinning of the drop, etc. Despite its importance, the mechanism at the contact line isn't yet fully understood. Theoretical and experimental work focused on microscopic behavior of contact angle have shown the dependence of contact angle on the rate of evaporation [5,6]. Anderson and Davis [7] studied the evaporation process macroscopically and showed different behavior of the contact angle and droplet base radius for the case of strong and weak evaporation. In the present study, we experimentally investigate the effect of evaporation rate on the macroscopic behavior of droplet evaporation. Figure 1 shows the snapshots of DI water droplet evaporating on a pristine cover glass, and the calculated contact angle as well as base diameter and volume of the drop versus time.

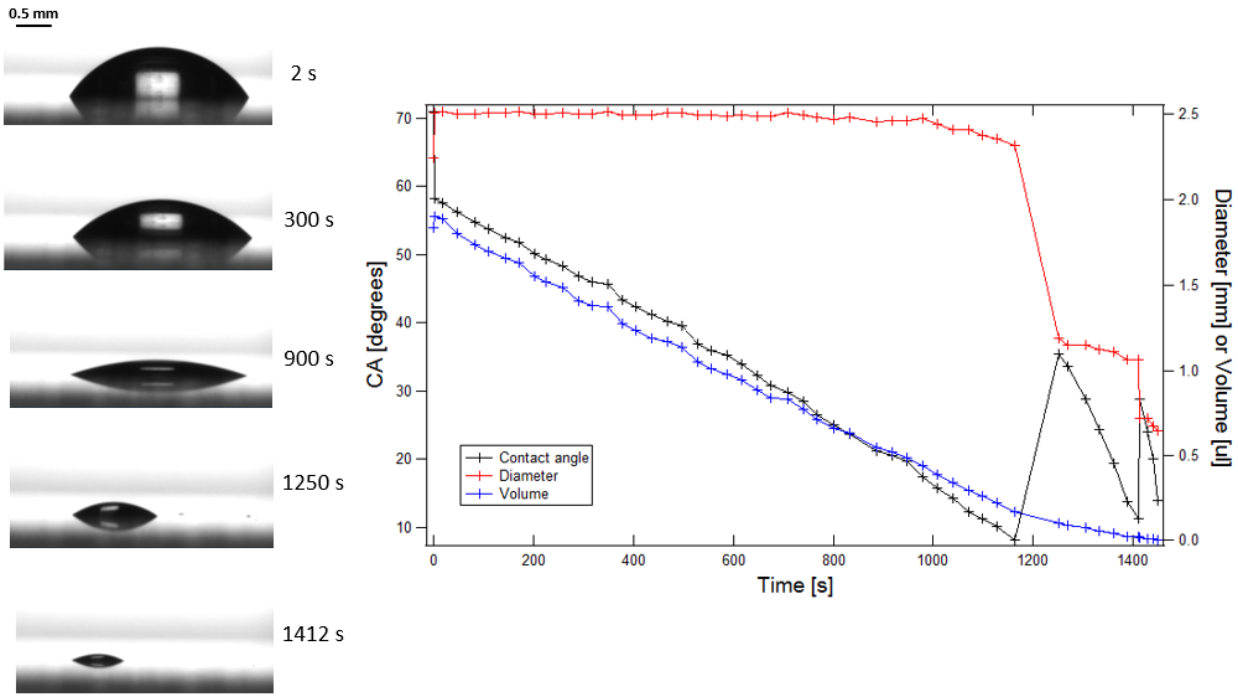

Figure 1. Snapshots of DI-water droplet evaporation on pristine cover glass, and calculated parameters

We have shown that when the evaporation rate changes, the macroscopic behavior of the droplet differs as well. This study contributes to the experimental knowledge of the physics of evaporation at macroscopic scale.

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