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Evaporation of sessile drops on soft membranes with capillary origami¹ YUHONG CHEN, DANIEL OREJON, PRASHANT VALLURI, VASILEIOS KOUTSOS, KHELLIL SEFIANE, the University of Edinburgh — Drops evaporating on soft substrates are common in nature, such as raindrops on tree leaves. If the substrate is thin enough, it can get folded by the action of surface tension of a drying drop. This folding is known as ‘capillary origami’, which provides a simple and cheap method for fabricating predetermined 3D structures at the micro/nano-scale. Here, we explore the influence of capillary origami on drop evaporation. Our experiments concern with evaporation of sessile microliter water drops on soft PDMS membranes. We consider the effect of substrate thickness noting that bending stiffness is a cubic function of thickness. Thus, drying sessile droplets of the same size can lead to either absent, partial or complete folding of the substrate. The evolution of evaporation fluxes is obtained through a microbalance with a resolution of 0.01 mg. Simultaneously the profiles of drops and membranes are recorded by a side-view CCD camera and a top-view optical camera, respectively. These videos are processed using ImageJ to extract the data and quantify the folding extent of the membranes. Our results show that foldable membranes reduce evaporation rates of sessile droplets thereby lengthening the drop lifetimes.

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