

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Evaporation of ethanol-water sessile droplet of different compositions at an elevated substrate temperature SARAVANAN BALUSAMY, SAYAK BANERJEE, PRADEEP GURRALA, PALLAVI KATRE, KIRTI SAHU, Indian Institute of Technology Hyderabad, India — We experimentally investigate the evaporation dynamics of sessile droplets with different compositions of ethanol-water binary mixture at different substrate temperatures. At elevated substrate temperature, we observed an early spreading stage, an intermediate pinned stage and a late receding stage of evaporation. Increasing the substrate temperature decreases the lifetime of binary droplets rapidly. We found that the lifetime of the droplet exhibits a non-monotonic trend with the increase in ethanol concentration in the binary mixture, which can be attributed to the non-ideal behaviour of water-ethanol binary mixtures. Interestingly, the evaporation dynamics for different compositions at high substrate temperature exhibits a self-similar trend showing a constant normalised volumetric evaporation rate for the entire evaporation process. This indicates that the evaporation dynamics of a binary droplet of a given composition at high substrate temperature is equivalent to that of another pure fluid with a higher volatility at room temperature. The evaporation rates of pure and binary droplets at different substrate temperatures are compared against a theoretical model developed for pure and binary mixture droplets. The model predictions are found to be quite satisfactory.

Kirti Sahu
Indian Institute of Technology Hyderabad, India

Date submitted: 27 Jul 2019

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