

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

The effect of spatial variation in the evaporative flux on the deposition from an evaporating droplet HANNAH-MAY D'AMBROSIO, STEPHEN K WILSON, BRIAN R DUFFY, ALEXANDER W WRAY, University of Strathclyde — The evaporation of sessile droplets occurs in numerous physical contexts, including in nature, industry and biology. Of key interest in many scientific and industrial processes is the deposit that is left behind after evaporation. For applications such as inkjet printing, control over the spatial distribution of solute at the end of the drying process is extremely important, with a particular need to obtain uniform deposits. In recent years there has been an explosion of research into the deposition from an evaporating droplet, particularly regarding the ring-like deposit (the “coffee-ring”) which often forms at the contact line. We investigate the effect of spatial variation of the evaporative flux on the deposition from an evaporating droplet. We consider a one-parameter family of evaporative fluxes, which includes both diffusion-limited and uniform evaporation, as well as fluxes with a maximum at the centre of the droplet, as special cases. We determine the flow velocity, the concentration of solute inside the droplet and the evolution of the deposit. We show that the deposit depends strongly on the evaporative flux profile, observing ring deposits, paraboloidal deposits and deposits near the centre of the droplet, and examine several interesting cases in detail.

Hannah-May D'Ambrosio
University of Strathclyde

Date submitted: 31 Jul 2020

Electronic form version 1.4