

Modulation of the coffee stain effect by the Marangoni effect

CONTEXT

Liquid coating involves spreading a liquid film containing a solute and then evaporating the solvent. This process offers great versatility in terms of the nature of the deposit, which can be organic, mineral or hybrid, and is particularly interesting for the functionalization of glass surfaces. However, the presence of defects such as dust can cause thickness gradients in the final deposit that can be visible to the naked eye. We have recently shown that the drying of liquid films of polymer solutions around a defect leads to the formation of relief on the final deposit (figure). We believe that this relief is amplified by a coffee stain effect. The coffee stain effect corresponds to the accumulation of solute at the periphery of a drop drying on a solid substrate. In some cases, the contact line remains trapped, and then the solute accumulates at the contact line, leading to the formation of a solute ring at the end of the drying process.

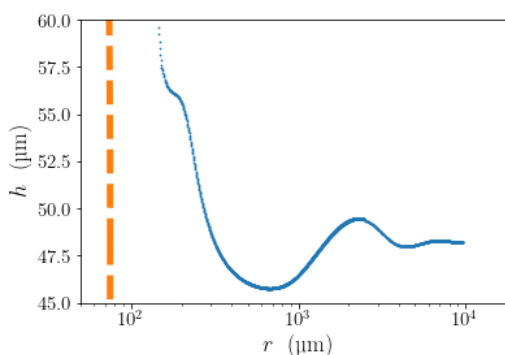
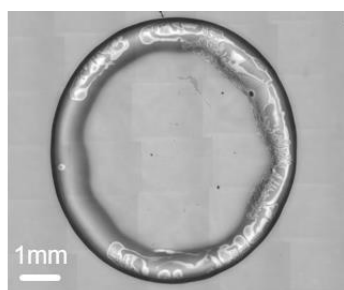


Figure: (left) Top view of a deposit obtained after drying a drop of polymer solution. (right) Thickness of the polymer deposit h around a spherical defect as a function of the distance r from the centre of the defect. The orange line indicates the edge of the defect.

GOALS OF THE INTERSHIP

The proposed internship will involve gaining a better understanding of the formation of this relief, by inducing Marangoni effects to modulate it. The experimental techniques used will be optical imaging and interferometry. From a practical point of view, the results will enable us to understand how to reduce variations in the thickness of polymer coatings obtained by drying liquid films. From a fundamental point of view, they will contribute to a better description of the Marangoni effects associated with drying, knowledge of which is still qualitative.

PROFILE

Student in the final year of a general engineering school or master's degree with a marked taste for experimentation.

DURATION

6 months

LOCATION

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