Contact line dynamics and superhydrophobic surfaces.

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Contact line dynamics is an old problem in the hydrodynamics community, which is not fully resolved particularly for superhydrophobic surfaces, where contact angles do not follow the classical Cox Voinov laws [1]. Superhydrophobic surfaces feature remarkable water repellency which are widely known to be governed by a combination of roughness at the micro/nano scale and low surface energy. During the last decades, they have been the interest of numerous fundamental and applied studies (surfaces microfabrication methods, anti-icing, low drag surfaces, self-cleaning surfaces…). However, the '*contact angle - contact line speed'* relationship has not been properly identified yet in literature.

This study aims to investigate the dynamical wetting properties of textured surfaces at the different scales involved in this phenomenon. We used the capillary bridge technique to explore large surfaces (centimetric) [2] and a sessile drop setup for the microscopic contact line shape on pillars.

On the one hand, I will present that the capillary bridge technique is an effective way to measure advancing and receding contact angles as a function of contact line speed, for microtextured surfaces without edge effect (fig 1a) [3]. I will show how we study more precisely the contact line morphology over time $r(\varphi, t)$ during contact line motions (fig 1b). On the other hand, I will present a complementary approach. We use a sessile drop setup on an inverted microscope to study the contact line shape and dynamics at micropillars scale. I will show our results on local deformations for an advancing and receding contact line on micropillars (rigid or deformable) and the measured macroscopic contact angles.

References:

[1] Karim A. M., Rothstein J. P., Kavehpour H. P., *Journal of colloid and interface science*, **513**, 658-665 (2018)
[2] Restagno F., Poulard C., Cohen C., Vagharchakian L., Léger L., *Langmuir*, **25** (18), 11188-11196, (2009).
[3] Cohen C., Bouret Y., Izmaylov Y., Sauder G., Forestier E. and Noblin X., *Soft Matter*, **15**, 2990-2998 (2019).

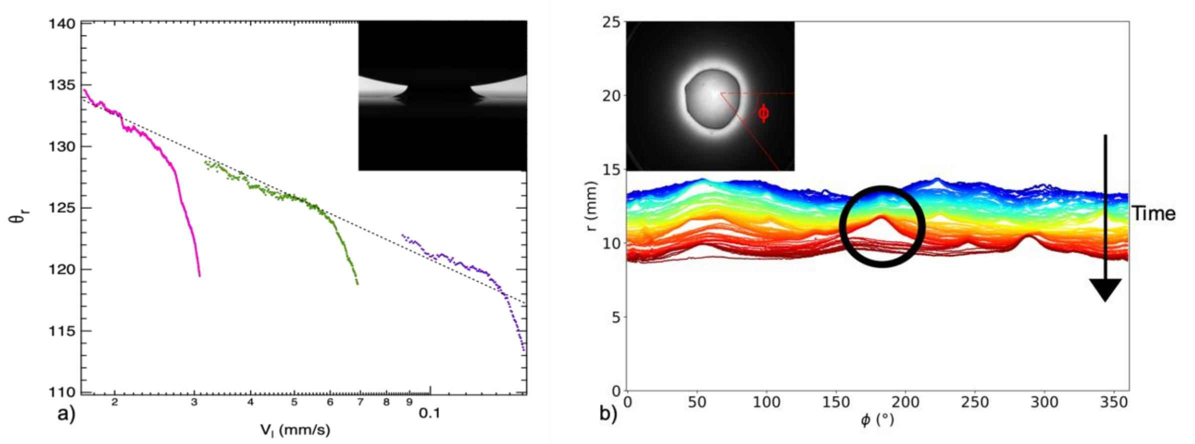

Figure 1: (a) Receding contact angle on a textured superhydrophobic surface as function of contact line speed. Measurement provided by the improved capillary bridge technique [3]. Three colors correspond to three different pull-off speeds of the substrate. (b) Radial analysis of the contact line position over time, and the effect of a default (black circle).