Drop spreading on poroelastic substrates

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In many situations, drops spread on soft and porous substrates, such as paper, wood or gels. The wetting dynamics depends on a coupling between spreading, absorption and deformation of the substrate. Here, we consider the effect of swelling on the spreading dynamics of a drop deposited on a model poroelastic gel. When a drop is placed on a surface that it fully wets, it usually spreads until the height of the drop is comparable to the size of a single fluid molecule. However, when some fluid is absorbed by the substrate, the drop will reach a maximum radius that depends on the porous and elastic properties of the substrate. Furthermore, we show that the spreading is slowed down due to the deformation of the surface that modifies the apparent contact angle locally [1].

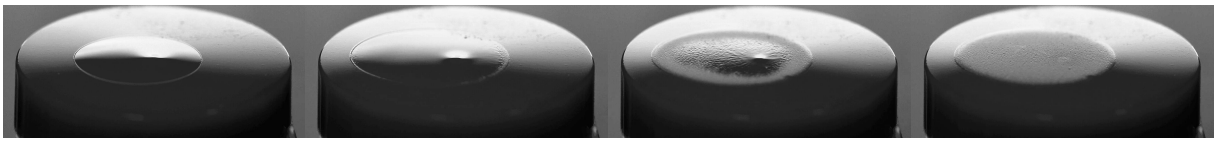

Figure 1. Chronophotography of the spreading and swelling dynamics of a drop of silicon oil ($\eta = 2.3$ mPa$\cdot$s) on a flat elastomer (PVS of modulus $E = 0.9$ MPa). Time between successive images 1.8 s.

References

1. P. Van de Velde *et al.*, Spreading and absorption of a drop on a swelling surface, *Europhys. Lett.*, **144**, 33001 (2023).