Wetting of yield-stress fluids

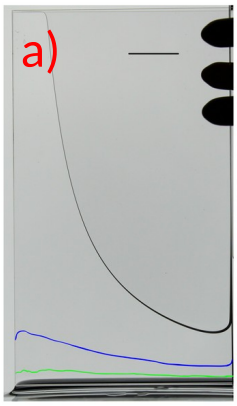
Catherine Barentin

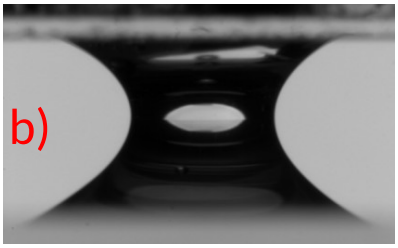
Institut Lumière Matière, Université de Lyon, Université Claude Bernard Lyon 1, CNRS
catherine.barentin@univ-lyon1.fr

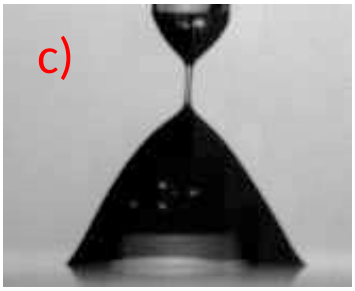
Yield-stress fluids such as emulsions, suspensions, gels or foams exhibit interesting mechanical properties depending on the applied stress. Indeed they behave like an elastic deform plastically and finally flow like a liquid above it. This intermediate behavior solid/liquid makes them particularly interesting for applications (food industry, cosmetics, building industry), but fundamentally difficult to describe.

In many applications such as coating, printing, imbibition, interfaces between a solid surface and a complex fluid are encounted

In this presentation, I will study the wetting properties of yield stress fluids by performing three capillary experiments: a) capillary rise [1] , b) adhesion due to a capillary bridge [2] and c) spreading of a drop of a yied-stress fluid [3]. In the case of simple fluids, such experiments are classical and the wetting laws (Jurin's law or Young law) are well kown. Here I will study the influence of the yield stress on the final capillary rise or on the final contact angle. I will also show the strong impact of the dynamic history and of the boundary conditions [4]. More importantly, I will show that exploring the competition between surface tension, which is an equilibrium property, and yield stress effects that often keep the system out of thermodynamic equilibrium due to a dynamic arrest is possible as soon as force balances are performed.







References

1. B. Géraud *et al.*, *Eur. Phys. Letters*, **107**, 58002 (2009).
2. L. Jorgensen *et al.*, *Soft Matter*, **11**, 5111 (2015).
3. G. Martouzet *et al.*, *Phys. Rev. Fluids*, **6**, 044006 (2021).
4. J. Péméja *et al.*, *Phys. Rev. Fluids* **4**, 033301 (2019).