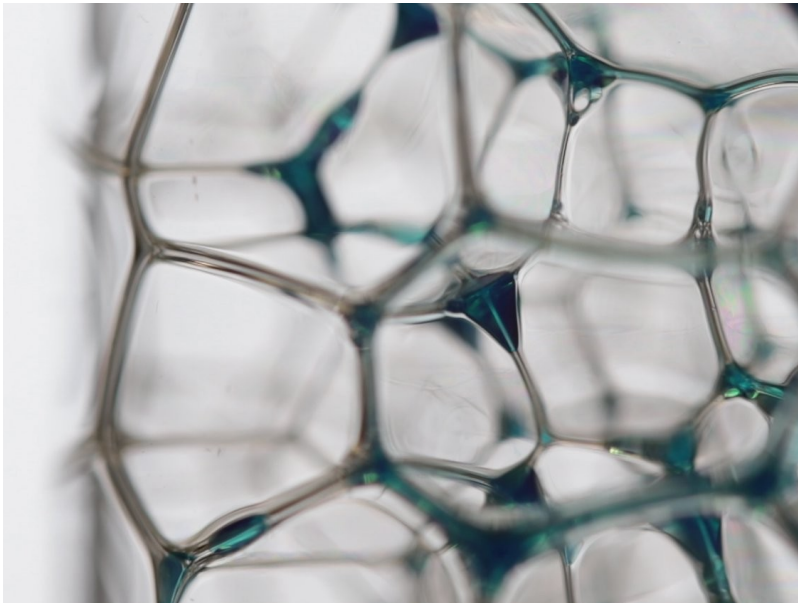
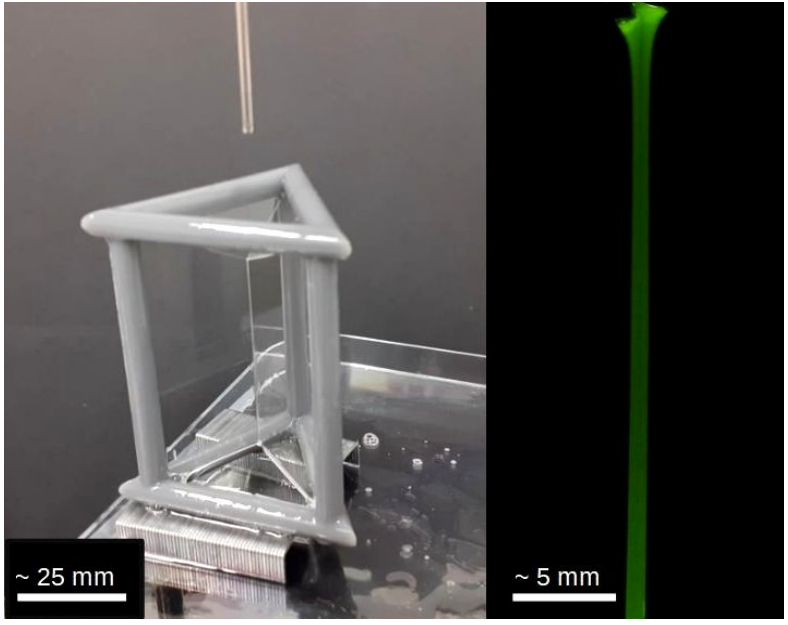
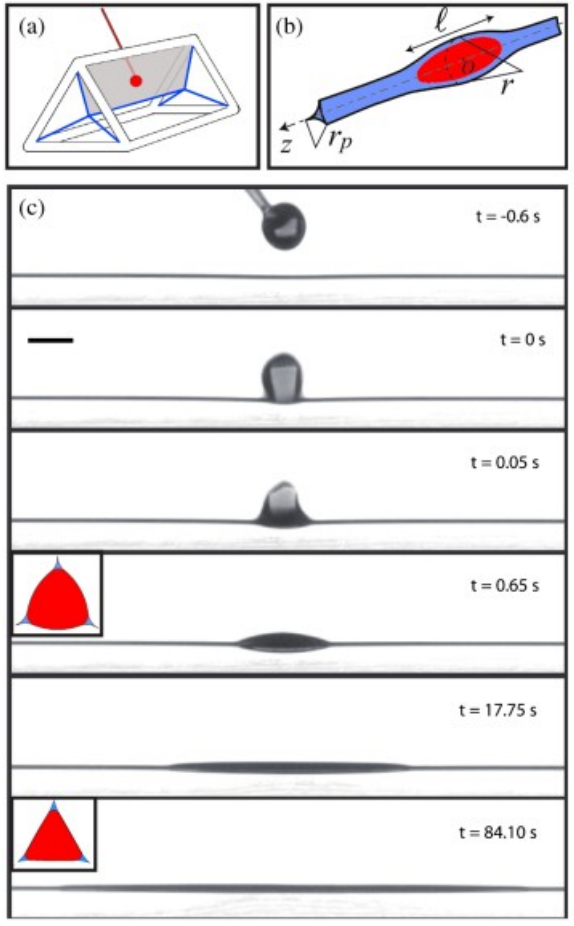
Characterization of a Water-silicone Multi-phasic Foam





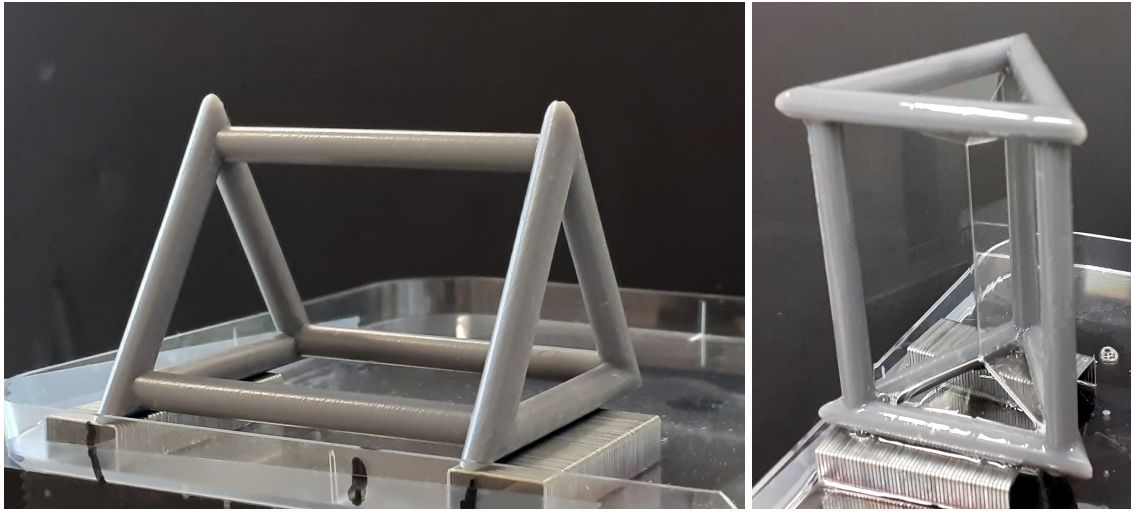
Lucas Saccucci
Under the supervision of Aurélie Hourlier-Fargette
At the Institute Charles Sadron

Subject Presentation



PHYSICAL REVIEW LETTERS : Capillary Flow of Oil in a Single Foam Microchannel (Keyvan Piroird and Elise Lorenceau)

Model :



Solutions

S1 :

- 500 mL of water
- 1.5 mL of glycerol
- 22.5 mL of Fairy
- 5.3 g of J-Lube

S2 :

- Pustefix (commercial bubble solution)

S7 :

- 500 g TPG
- 10 g DBP

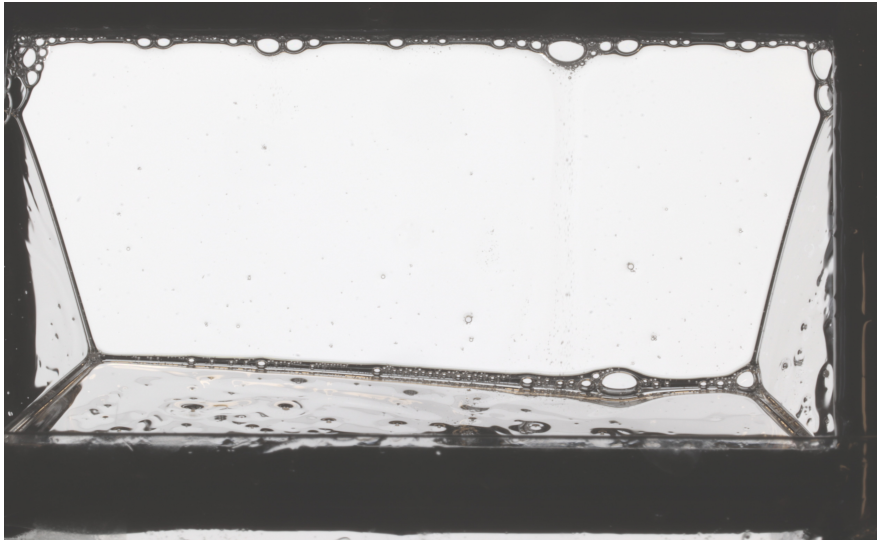
	Water	Glycerol	J-Lube	Fairy	DBP
S3	400 g	100 g	5.3 g	5 g	Ø
S4	400 g	100 g	5.3 g	5 g	0.615 g
S5	250 g	250 g	5.3 g	5 g	Ø
S6	250 g	250 g	5.3 g	5 g	0.615 g

First tests

- Evolution of the Plateau’s border

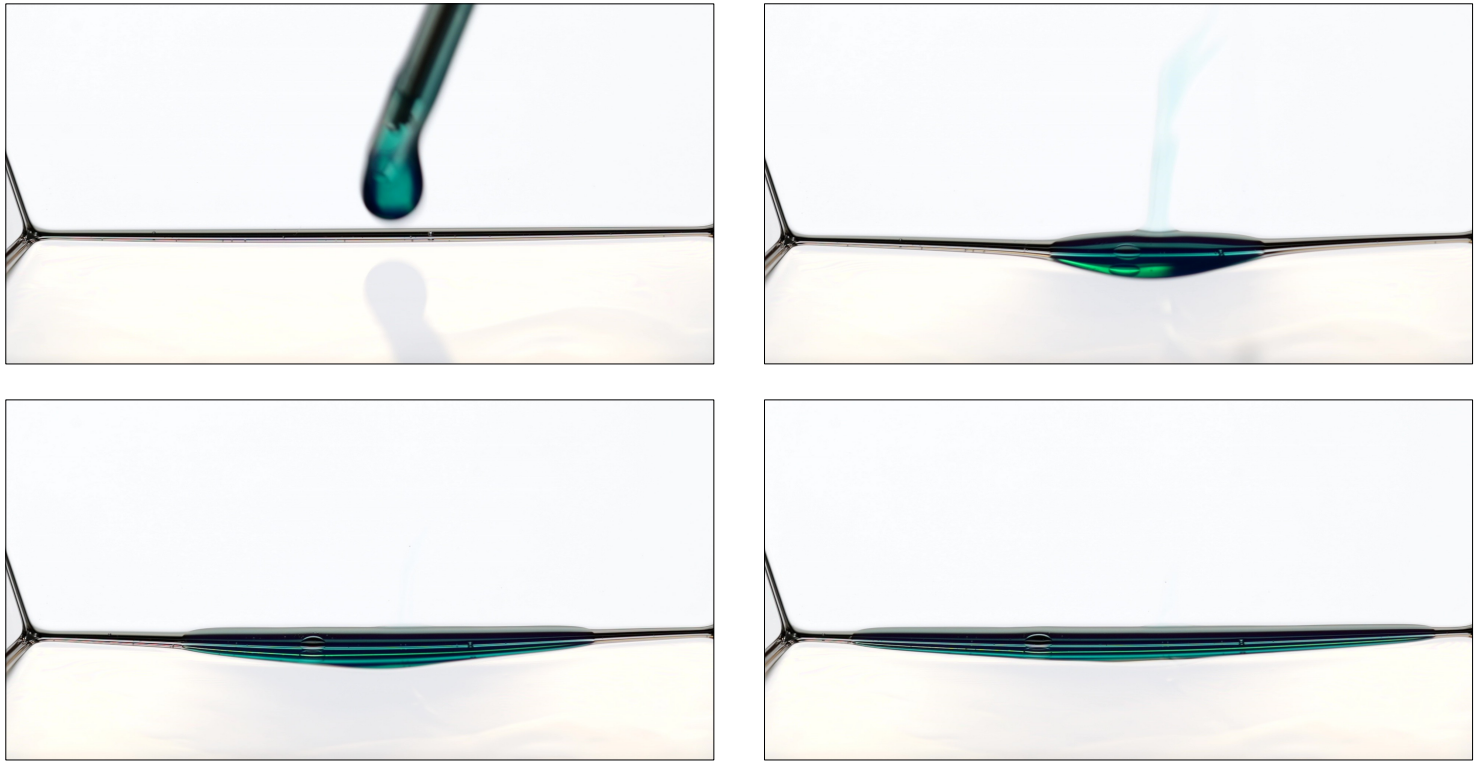
S3 :

S5 :



First tests 2

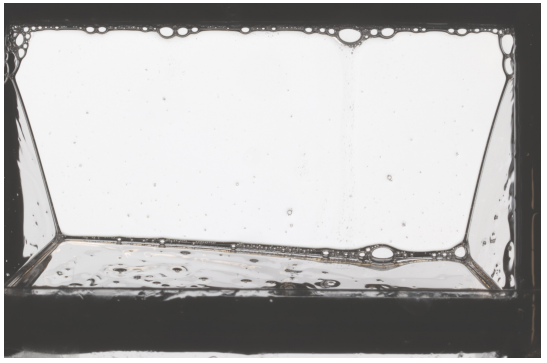
- Ajunction of the blue dyed oil



Difficulties

- Stability vs Mass

S3 : 

S5 : 

- Precision of the micropipette

- What are we measuring ?

Other tests :

Vertical measures + fluorescent dye

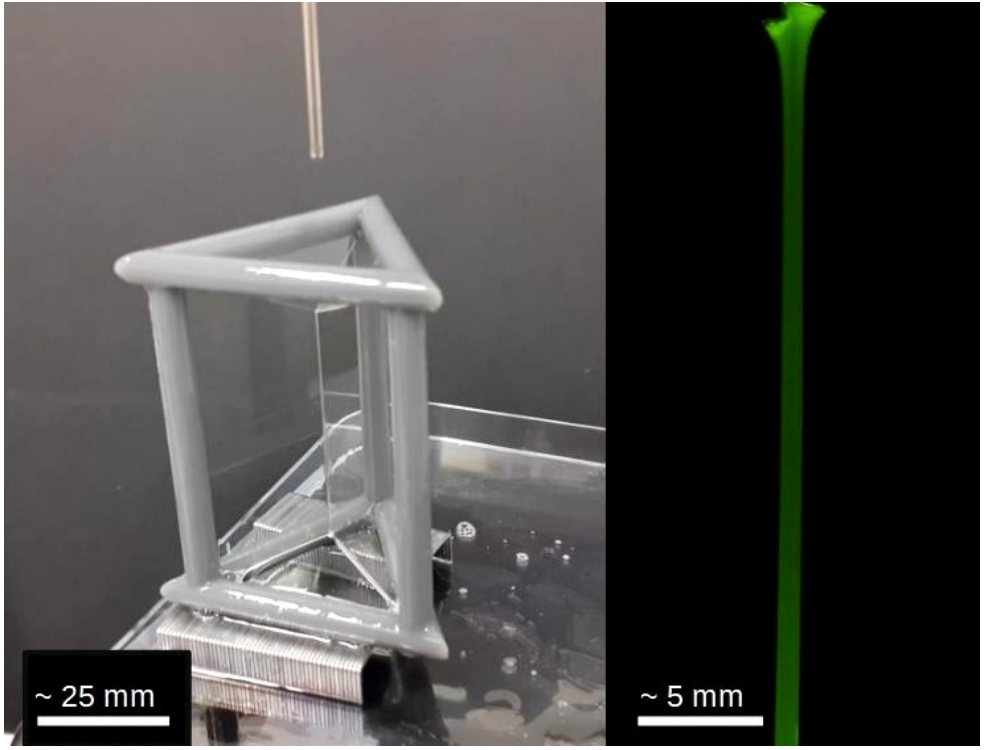
- Original article :

  Elasticity of a soap film junction, F. Elias,

  E. Janiaud, J.-C. Bacri, et al

- Modified equation

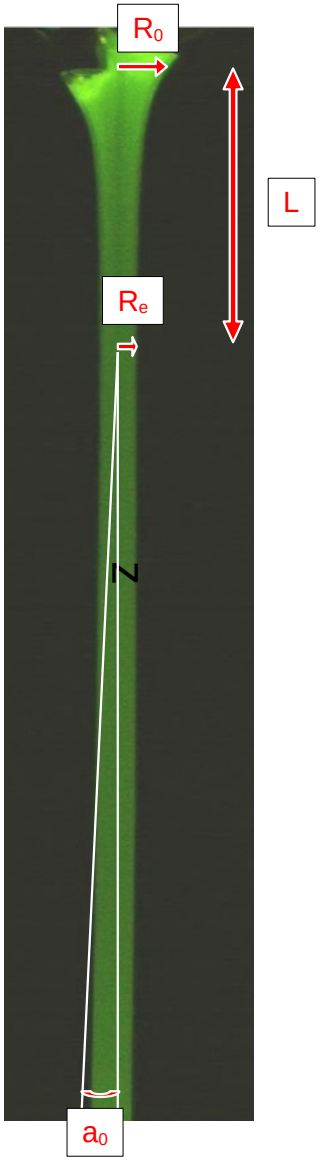
$$\epsilon(z) = 2(R_0 + (R_e - R_0)e^{\frac{-z}{L}} + a_0 z)$$



Relevant parameters

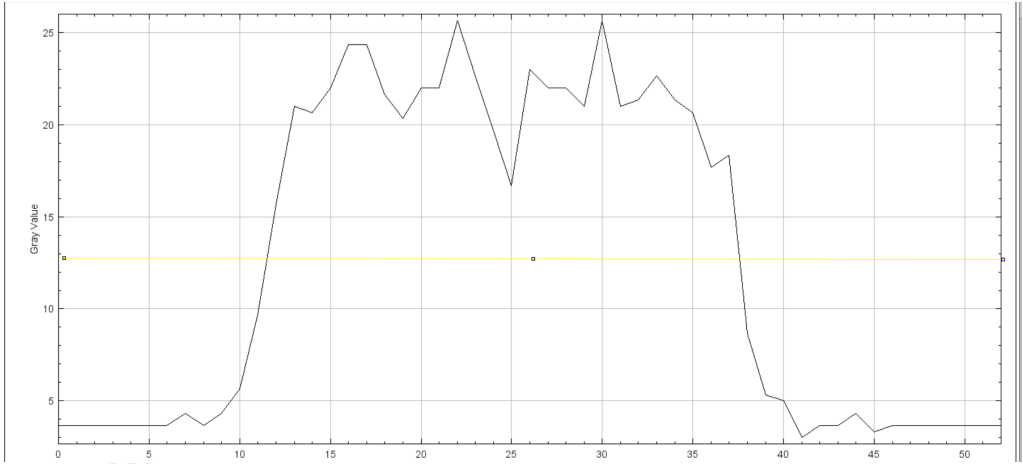
$$\epsilon(z) = 2(R_0 + (R_e - R_0)e^{\frac{-z}{L}} + a_0 z)$$

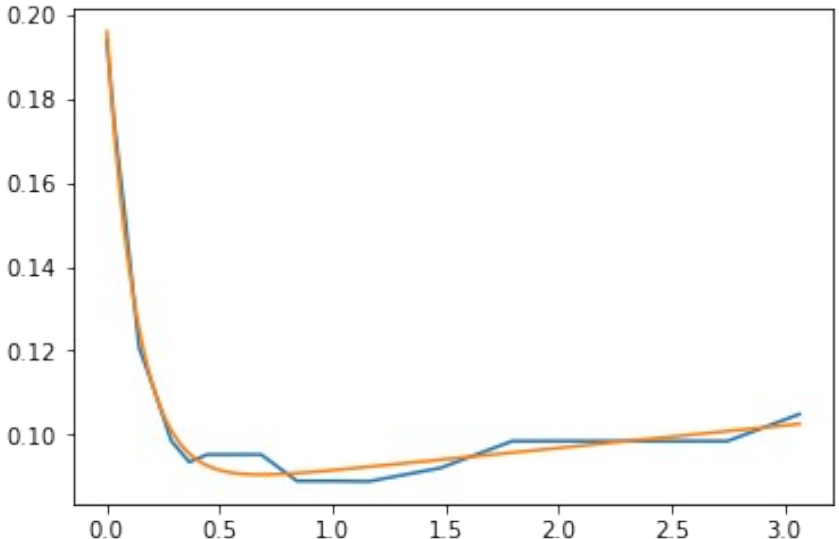
- R_0 : highly depending on the geometry
- L : should not vary significantly
- a_0 : linear correction
- R_e : depend on the flow rate



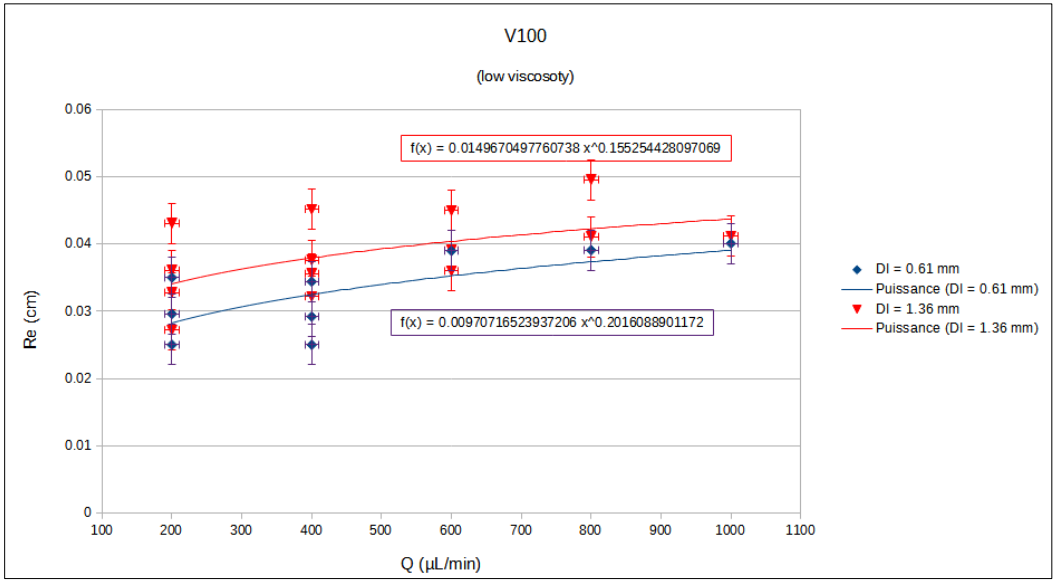
Detailed protocol

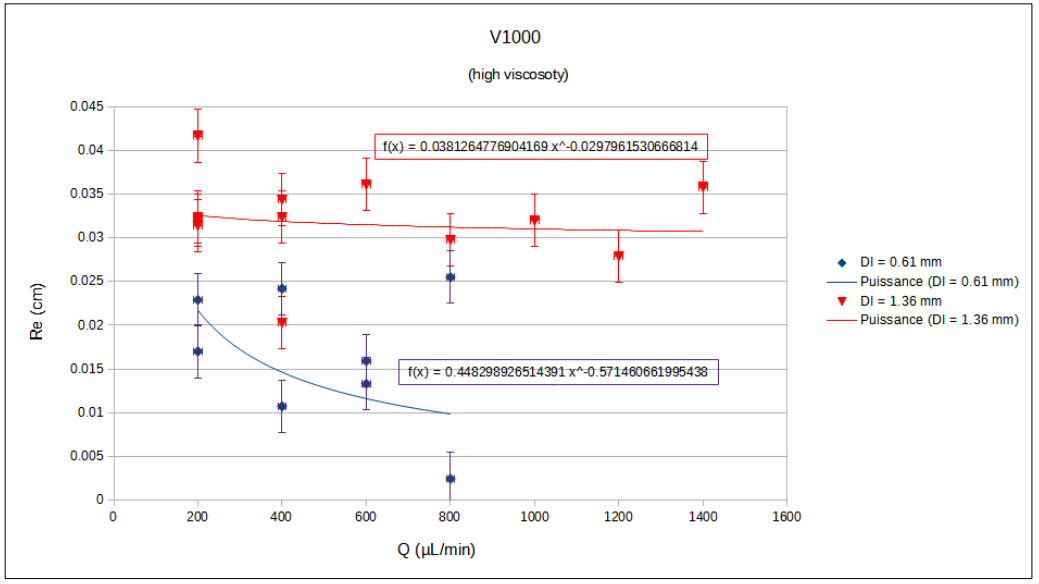
- Take a video of the Plateau's border at different flow rate (Q=200, 400, 600, 800, 1000 µL/min)
- When the flow is stationary, take a horizontal slice at different distances of the cannula
- Use the full width at half maximum of the intensity for the thinkness of the oil.
- Use a python program for the fit





Results





For a small viscosity (V100), Re follows a law close to the $R_e \sim Q^{\frac{1}{4}}$ of the article

(power 0.2 and power 0.16 repectively for the DI = 0.61 and 1.36 mm)

For the larger viscosity (V1000), it follow a totally different law

(power -0.57 and power -0.03 repectively)

Critics

- Not enough measurements (high incertitudes)
- Hysteresis and Oscillations
- The « a_0 » parameter