

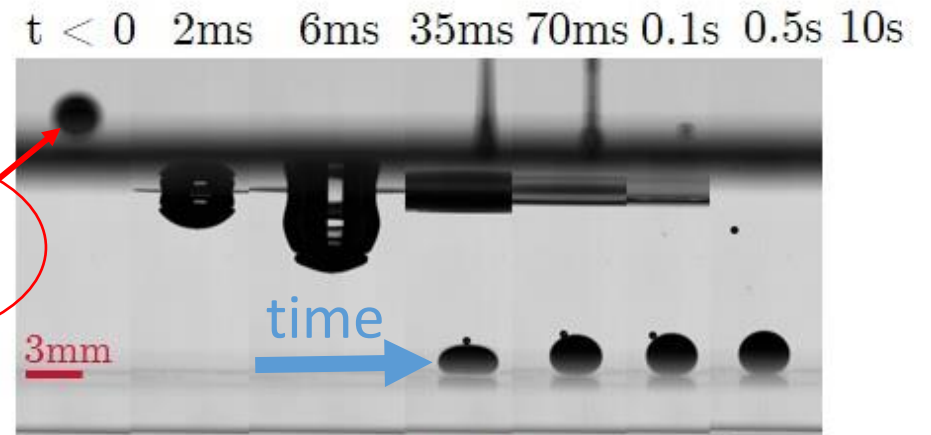
# Surface stress and shape relaxation of gelling droplets

Julie Godefroid, David Bouttes\*, Alba Marcellan, Etienne Barthel & Cécile Monteux  
SIMM, ESPCI/CNRS/SU,  
Paris, France

\*Saint-Gobain Recherche Provence



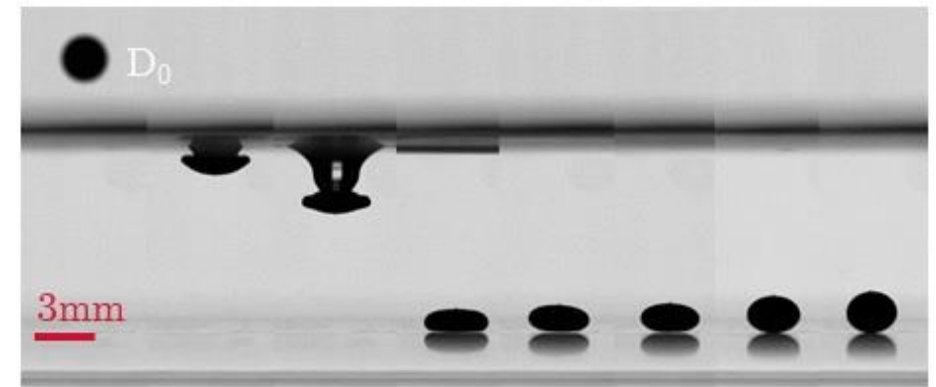
Aqueous sol of alginate



a. oil bath

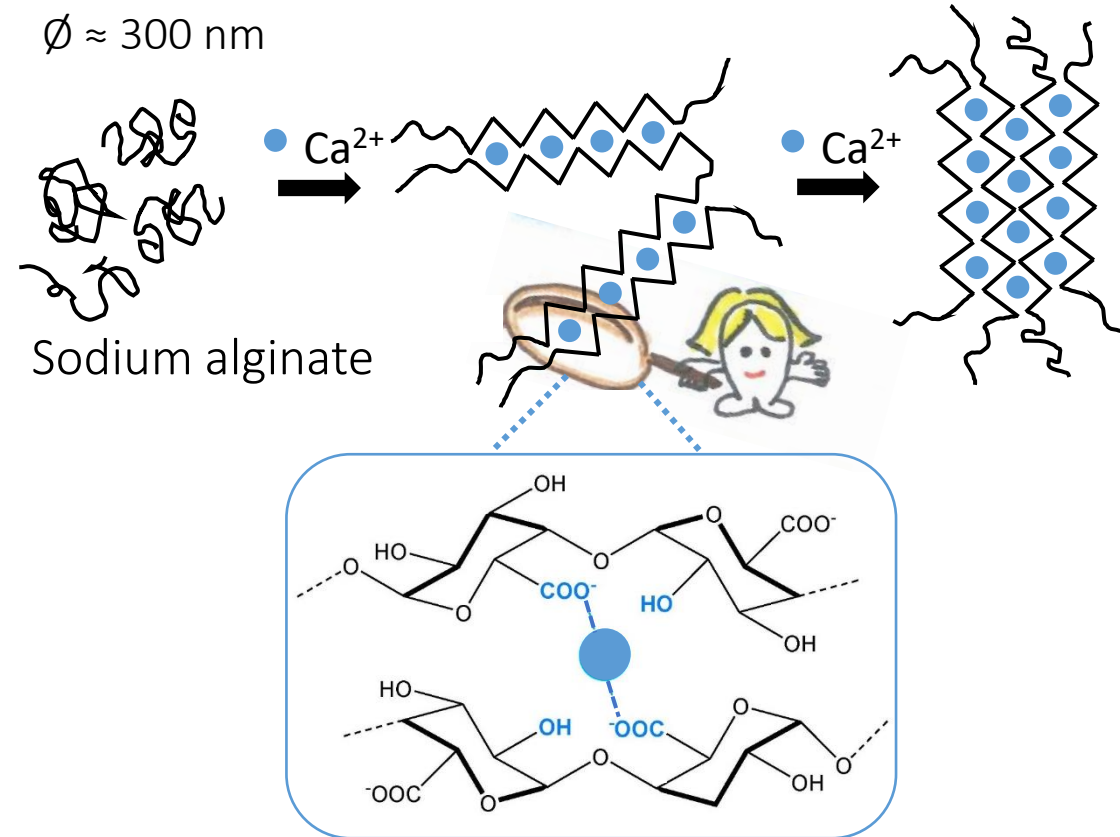
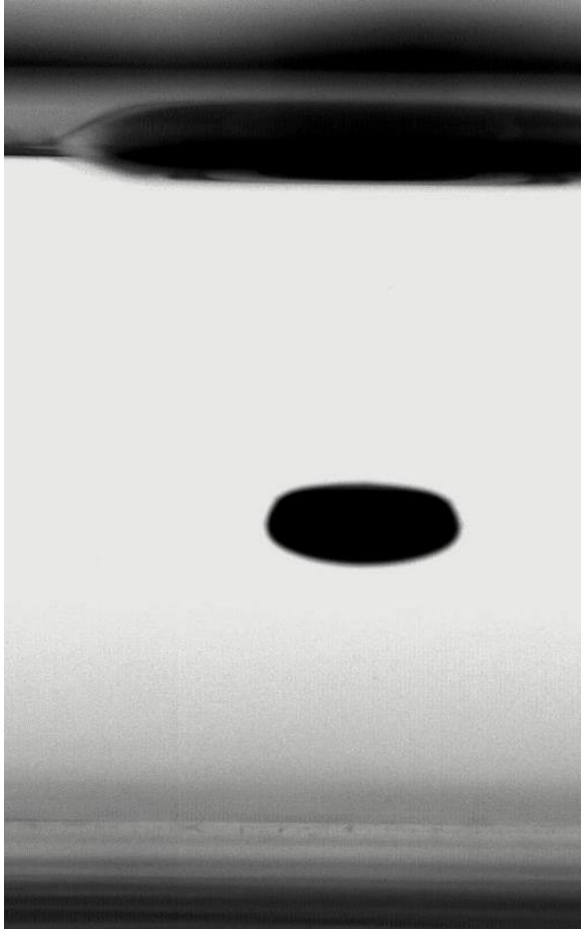


b. water bath  $[\text{Ca}^{2+}] = 0 \text{ g/L}$



c.  $\text{CaCl}_2$  bath  $[\text{Ca}^{2+}] = 158 \text{ g/L}^1$

# Calcium -> alginate gelation & syneresis

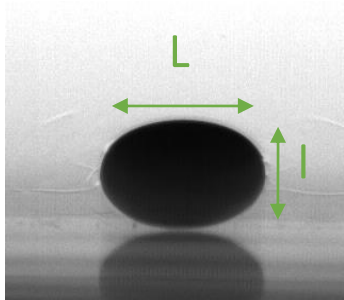


model : droplet (radius  $R$ ) with

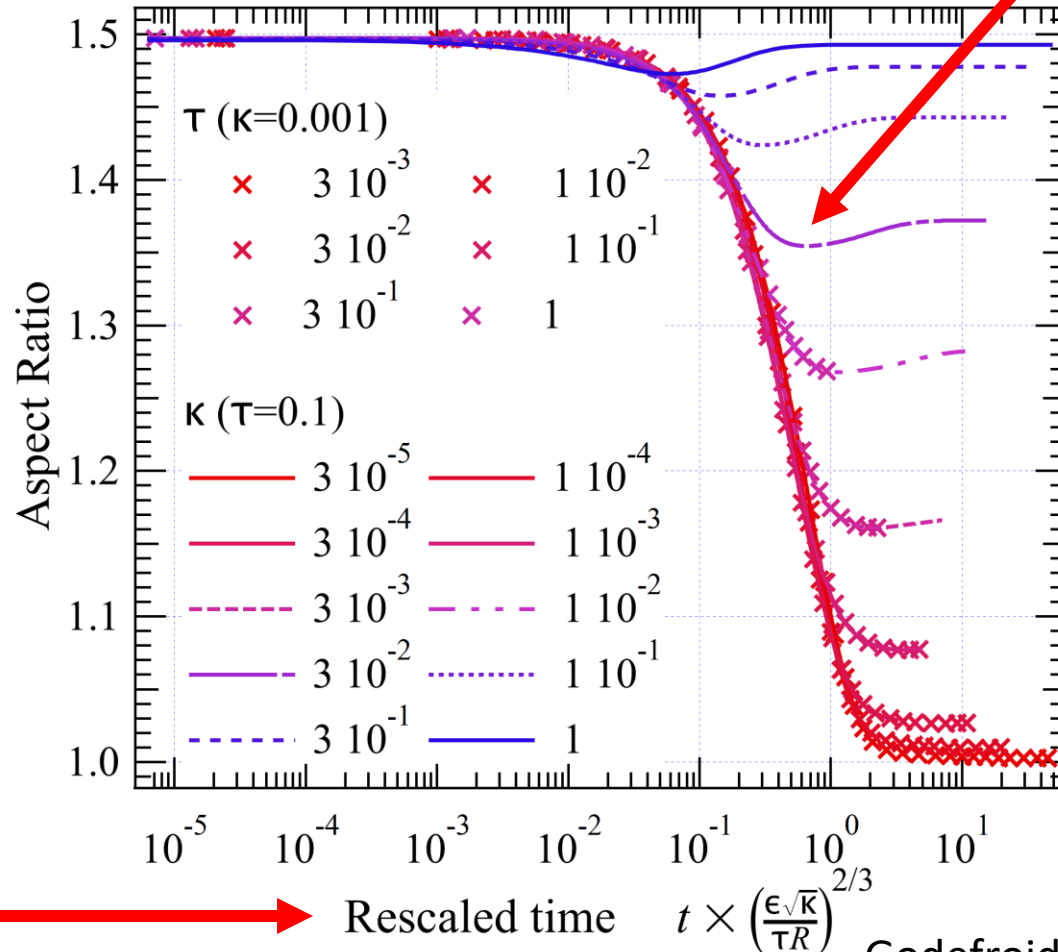
- viscous flow  $\tau$
- Gelation  $\mu_0$

- Ca++ diffusion  $\kappa$
- contraction  $\varepsilon$

$$t_s \simeq \frac{R^2 \varepsilon}{\kappa}$$



Aspect Ratio  
AR = L/l



$$t_c = \left(\frac{\tau R}{3\varepsilon\sqrt{\kappa}}\right)^{2/3}$$

# Drop relaxation – impact of $\text{Ca}^{++}$ concentration

