SUPPLEMENTARY INFORMATION
Mimicking coalescence using a pressure-controlled dynamic thin film balance

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FILM CHARACTERISTICS DURING DRAINAGE

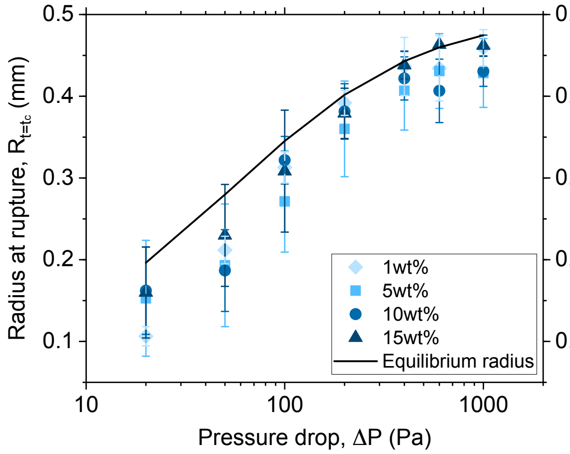

FIG. 1: **Radius at rupture:** The radius at rupture ($t = t_c$) as a function of applied pressure drop. The equilibrium radius as calculated from a pressure balance at the Plateau border (Eq. 4 of main article) is shown as a solid line.

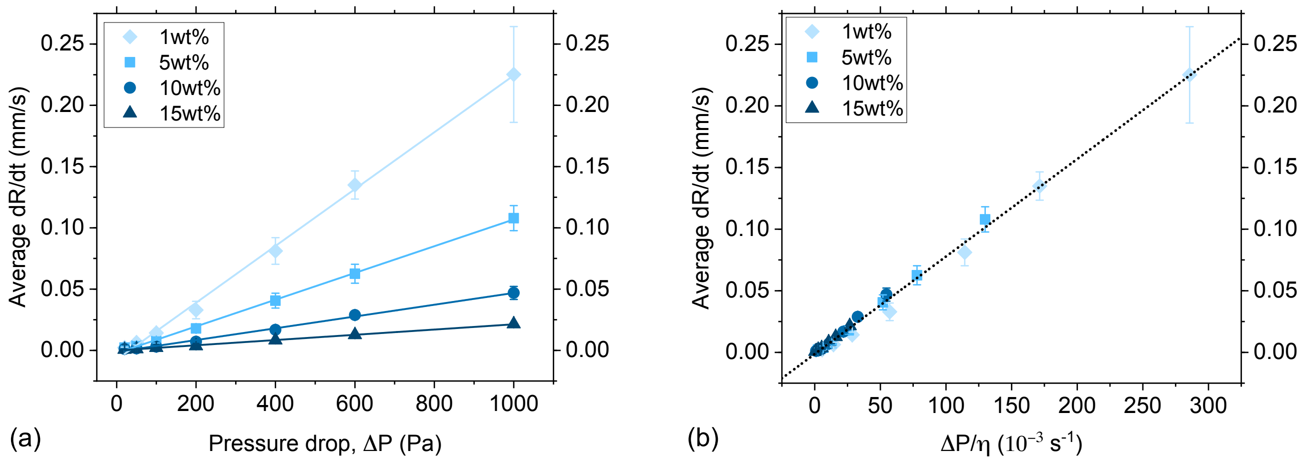

FIG. 2: **Film expansion rates:** (a) The average film expansion rate as a function of pressure. A linear dependence was observed for all solutions. The average expansion rate was determined according to $dR/dt = (R_{t=t_c} - R_{t=0})/t_c$. (b) The average film expansion as a function of reduced pressure drop, $\Delta P/\eta$. Very good superposition of the individual rates is observed.

FILM CHARACTERISTICS DURING RETRACTION

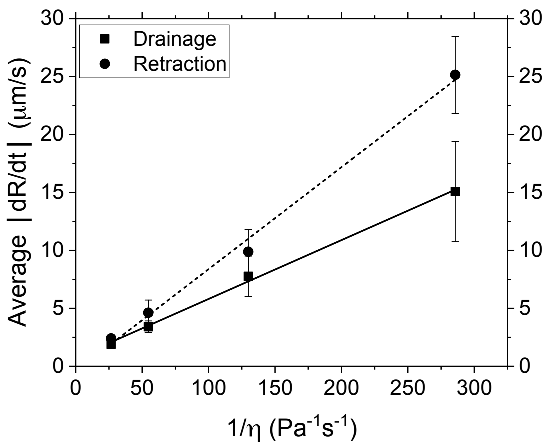

FIG. 3: **Evolution of the film radius during drainage and retraction:** The absolute values of the average expansion and contraction rate during drainage ($+\Delta P$) and retraction ($-\Delta P$), respectively, as a function of the inverse viscosity.

VAN DER WAALS INTERACTIONS

The non-retarded Hamaker constant was calculated according to the Lifshitz theory [1, 2] (Eq. 1) and was found to be equal to $A_H = 5.5 \times 10^{-20}\ J$.

$$A_H = \frac{3}{4} k_B T \left(\frac{\epsilon_{cont} - \epsilon_f}{\epsilon_{cont} + \epsilon_f}\right)^2 + \frac{3 v_e \hbar}{16\sqrt{2}} \frac{\left(n_{cont}^2 - n_f^2\right)^2}{\left(n_{cont}^2 + n_f^2\right)^{3/2}} \tag{1}$$

where k_B is the Boltzmann constant, T is the temperature, ϵ_{cont} and ϵ_f are the dielectric constants of the continuous phase and the film, respectively, n is the refractive index, $\hbar$ is Planck's constant and v_e is the electron frequency. The dielectric constant and the refractive index of the film were assumed to be equal to those of pure hexadecane, with $\epsilon_f = 2.08$ [3] and $n_f = 1.434$ [4]. The contribution of the van der Waals (vW) interactions in the disjoining pressure of the film can be calculated from equation [2]:

$$\Pi_{vW} = -\frac{A_H}{6\pi h^3} \tag{2}$$

where h is the thickness of the film. The calculated values are shown in Fig. 4. As explained in the main articles, the retarded Hamaker constant has been found to provide a better description of the film dynamics [5]. However, the differences in the calculated critical thickness, either with the Chesters [6] or with the modified Vrij [7, 8] model, will be negligible and within the observed experimental standard standard deviation.

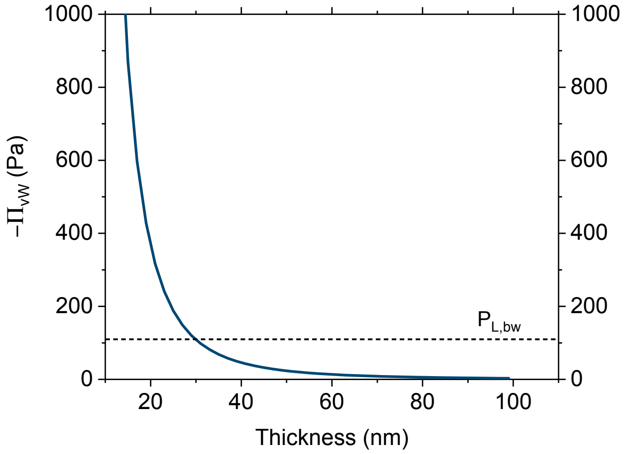

FIG. 4: **Van der Waals interactions:** The calculated disjoining pressure due to the attractive van der Waals interactions. The Laplace pressure due to the curvature of the Plateau border is also shown for comparison.

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[5] D. Y. Chan, E. Klaseboer and R. Manica, *Soft Matter*, 2011, **7**, 2235–2264.
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