Supplementary Information

Capillary force on a tilted cylinder: Atomic Force Microscope (AFM) measurements

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SI.1 Capillary rise experiment

A capillary rise experiment was performed to obtain the values of $\gamma\cos\theta$ for decane and for dodecane. By measuring optically the height of capillary rise h_j in clean glass tubes of inner diameter going from 0.2 mm to 0.5 mm, it is possible to measure $\gamma\cos\theta$ through Jurin's law with the following expression:

$$h_j = \frac{4\gamma\cos\theta}{d_i\rho g}, \quad (1)$$

with ρ the liquid density, d_i the tube's inner diameter, and g the standard gravitational acceleration on Earth. This experiment was performed in the same room as the AFM experiments, thus in the same temperature and humidity conditions, with the same liquids (decane and dodecane). In figure SI.1, h_j is plotted as a function of $\frac{4}{d_i\rho g}$ for decane and dodecane. A one parameter linear fit of the data yields $\gamma\cos\theta$ as the fitting parameter.

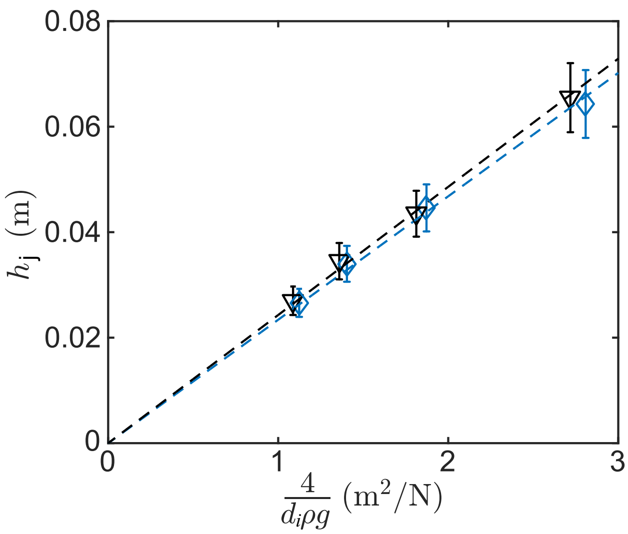

Figure SI.1 Height of capillary rise h_j as a function of $\frac{4}{d_i\rho g}$, for decane (blue diamonds) and dodecane (black triangles). The dashed lines are linear fits with a zero y-intercept.

SI.2 Discussion on the choice of $h = 0$

As explained in the article, the deflection d as a function of the immersion depth h is fitted linearly. This implies that the value of y-intercept d_0 depends on the choice of the origin of the distance $h = 0$. To test the consequences of this choice, we compare in figure SI.2 normalized y-intercepts $\frac{kd_0}{\pi D_0}$ obtained with $h = 0$ set at the meniscus breakup (same data as in the bottom panel of the paper's figure 4, for dodecane on the 3 probes), with the ones obtained from the same deflection data, but with $h = 0$ set at the meniscus formation (named phase 2 in the paper). The difference between the data points obtained with the two references increases with the immersion angle i, as the slope s of the deflection data also increases with i. When fitting the normalized d_0 versus $\tan i$ data with straight lines, the slope s_δ is about 4% smaller for probes # 1 and 3 and 8% smaller for probe # 2 when defining $h = 0$ at the meniscus formation rather than breakup. This means that measuring $\gamma\cos\theta$ from the s_δ data, following method 2, also implies an additional systematic error due to the choice of $h = 0$, of the order of a few percents. There is however less than 0.5% difference in the y-intercept δ_0 values. This means that measuring $\gamma\cos\theta$ from the δ_0 data, following method 1, is robust with respect to the choice of $h = 0$.

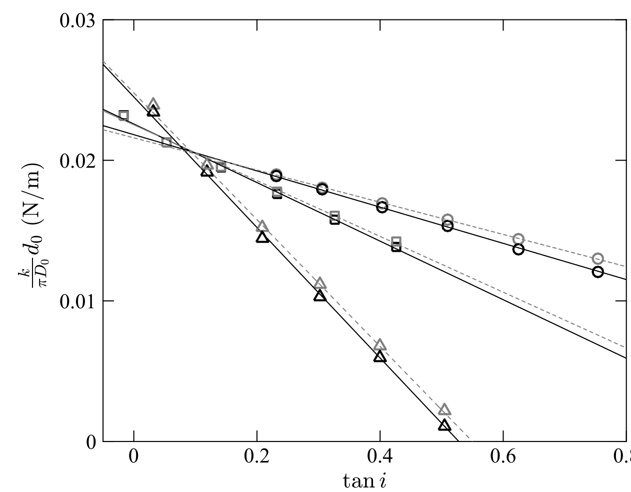

Figure SI.2 Normalized y-intercept $\frac{kd_0}{\pi D_0}$ as a function of $\tan i$, for dodecane on probe # 1 (triangles), 2 (circles) and 3 (squares). Black: $h = 0$ set at meniscus breakup (same data as in the bottom panel of figure 4 in the main paper). Grey: $h = 0$ set at meniscus formation. The lines are linear fits of the data.