Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information

Lubrication dynamics of swollen silicones to limit long term fouling and microbial biofilms

*Nicolas Lavielle[1], Dalal Asker[1,2] and Benjamin D. Hatton[1]**

[1]Department of Materials Science and Engineering, University of Toronto, Toronto, ON M5S, Canada

[2] Department of Food Science & Technology, University of Alexandria, Alexandria, Egypt

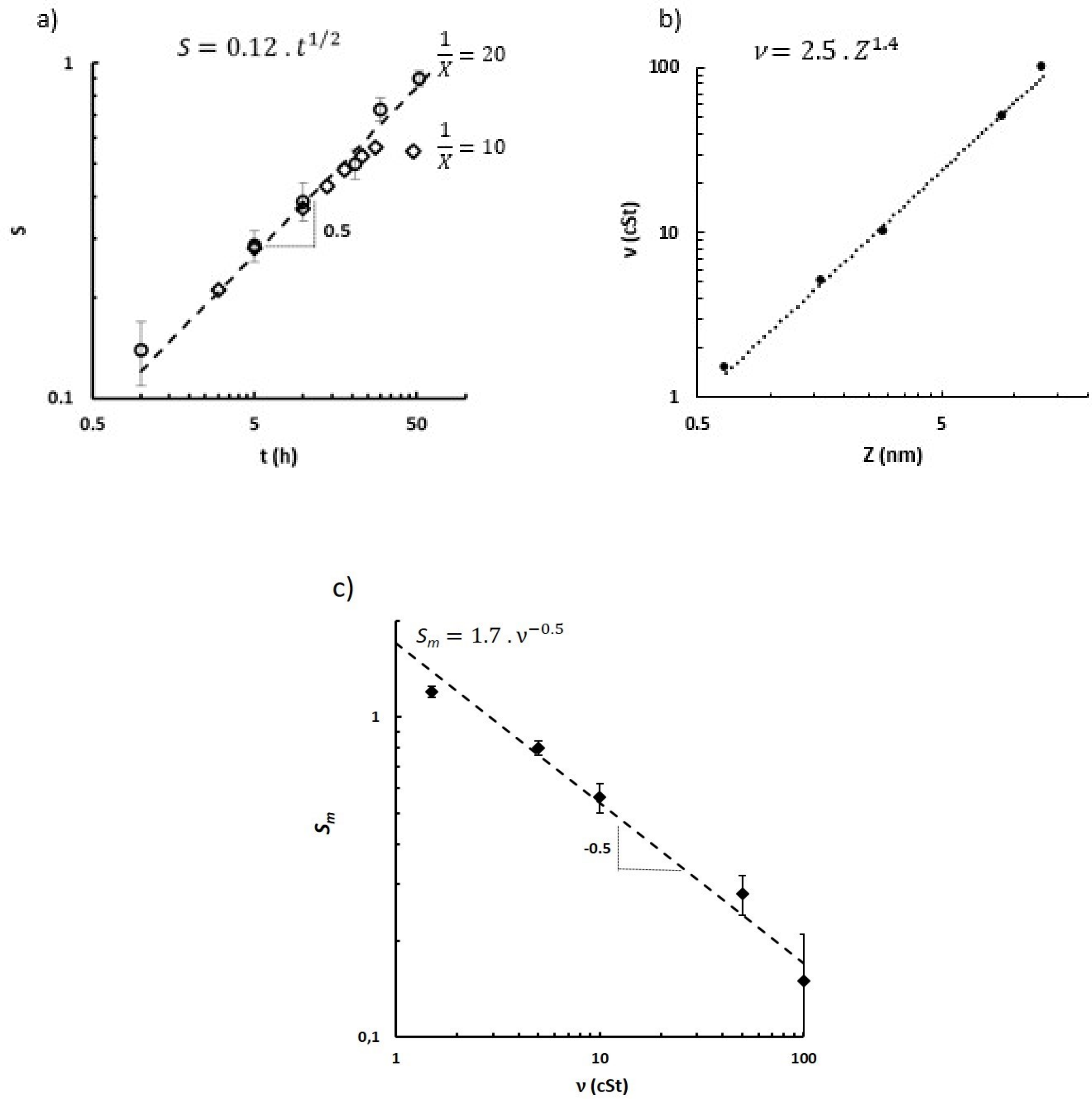

Figure S1: Swelling of iPDMS: (a) Kinetics of swelling of silicone oil (10cSt) for *1/X* = 10 and 20. (b) Kinematic viscosity of the silicone oil as a function of the chain length (Z) (valid for 1.5 ≤ ν ≤100 cSt). (c) Maximum swelling degree (S_m) as a function of the oil kinematic viscosity (ν) (*1/X*=10).

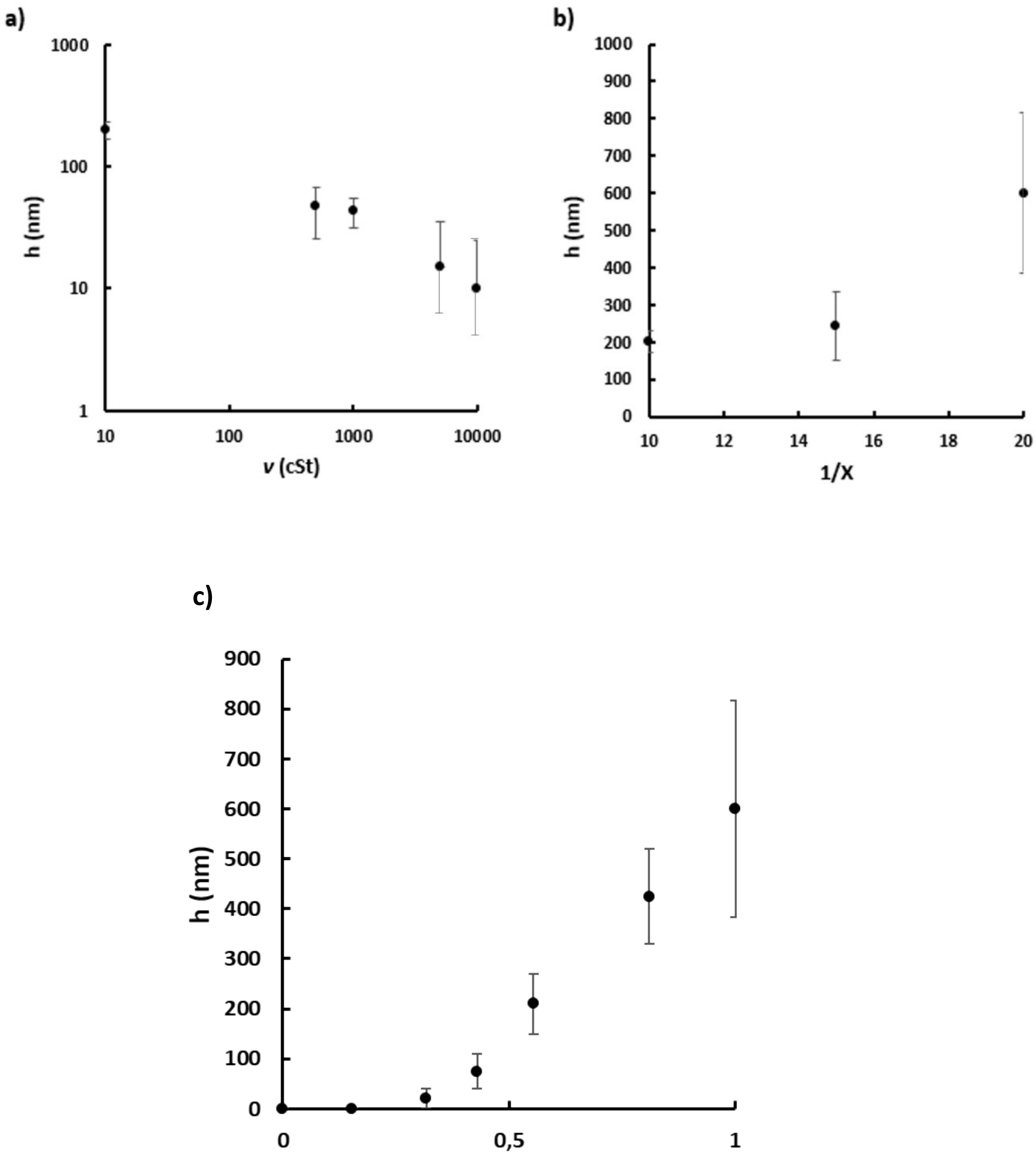

Figure S2. De-swelling phase of iPDMS in air: (a) the kinematic viscosity of the oil – v (with $1/X$=10, S/S_m=1, t=240h), (b) the crosslinker amount of the network - X (with v=10cSt, S/S_m=1, t=240h) and (c) the swelling degree – S (with $1/X$=20, v=10cSt, t=240h)

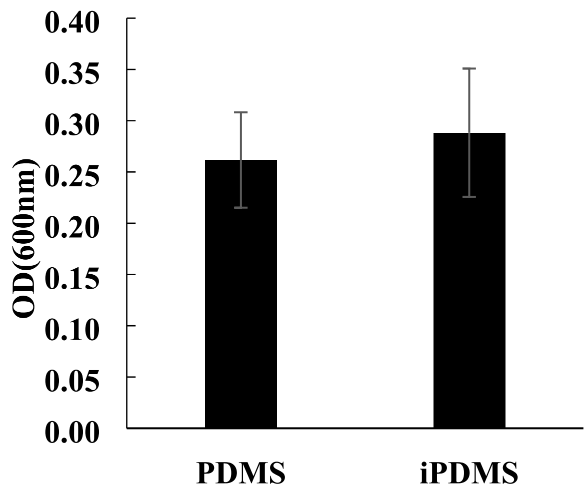

Figure S3: *P. aeruginosa* growth at OD 600_{nm} in presence of PDMS and iPDMS samples. Cells were grown in LB medium without salt and supplemented with 0.5% L-arabinose under static culture at room temperature for 5 hours.

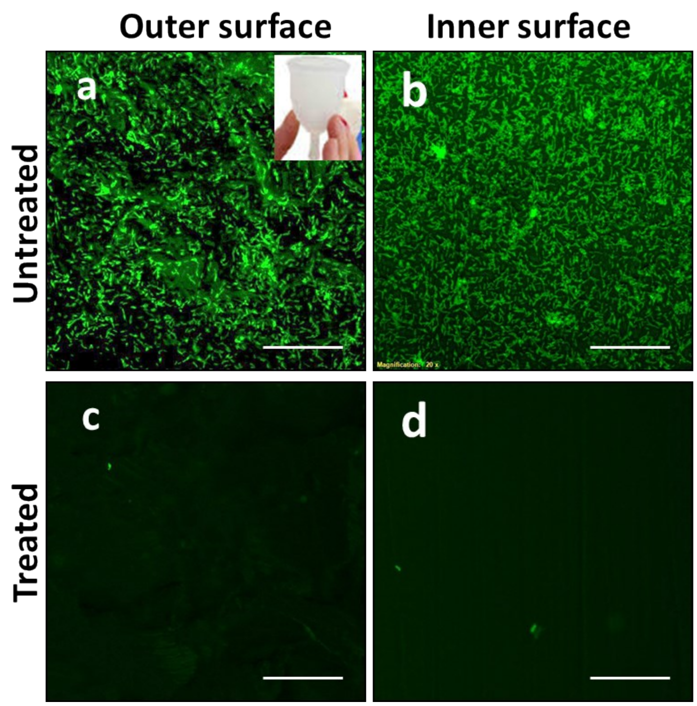

Figure S4: *P. aeruginosa* cells adherence and biofilm formation on oil infused menstrual cup, compared to untreated cup. (a,b) Biofilms were formed on outer and inner surfaces of untreated cup, respectively. (c,d) biofilms formation was completely inhibited on both outer and inner surfaces of the infused cup. Biofilms were grown in LB medium, without salt and 0.5% arabinose, 5 hrs in static culture and at 25°C. Biofilms were stained with SYTOX Green. Images were observed with 10X dry objectives. Scale bars, 25 µm.

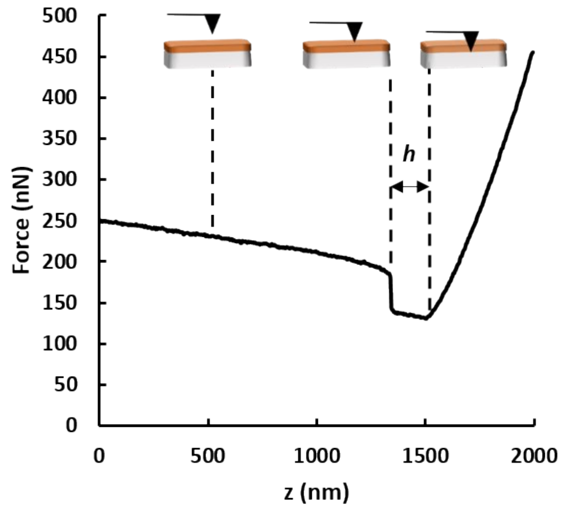

Figure S5: Typical force-displacement approach curve obtained by AFM (ramps in contact mode) for iPDMS to measure the thickness of the oil layer interface (*h*).

Contact angle hysteresis (CAH) as a function of *S* and *h*:

Figure 1a shows the evolution of the CAH of iPDMS with different m_l / m_{lm}. All the measurements were performed after 10 days of release. We can observe that the CAH decreases with an increase of m_l / m_{lm}. We know that *h* increases with *S*. A layer of oil, if covering the surface of the gel uniformly, should exhibit low CAH, which would indicate a good mobility of a droplet of water on the surface. Figure 1b shows the dependence of the CAH with the thickness of the oil layer. We can observe a drop of the CAH below the value of 10 for a minimal thickness layer of 20nm and that the CAH keep decreasing until a minimum value of 1 degree with an increase of the thickness of the oil layer from 20 nm to 600nm. CAH is largely influenced by the number of pinning points.[7,8] With an increase of the oil layer thickness, the number of pinning points is decreasing because they are immersed in the liquid phase. The coverage of the pinning points of the solid surface (defects, inhomogeneities) by the formation of the oil layer is responsible for the decrease of the CAH.

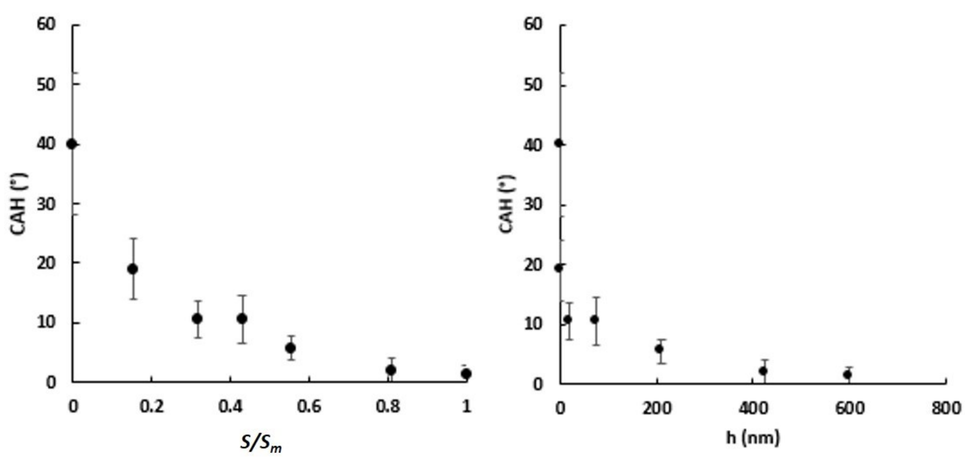

Figure S6: Contact angle hysteresis (CAH) of iPDMS (*1/X*=20, *t*=10 days, *v* =10cSt) as a function of S / S_m (a), the thickness of the oil layer, *h* (b).