Electronic Supplementary Material (ESI) for Soft Matter.

Bacterial Motility Enhances Adhesion to Oil Droplets

Narendra K. Dewangan and Jacinta C. Conrad*

Department of Chemical and Biomolecular Engineering, University of Houston, Houston

E-mail: jcconrad@uh.edu

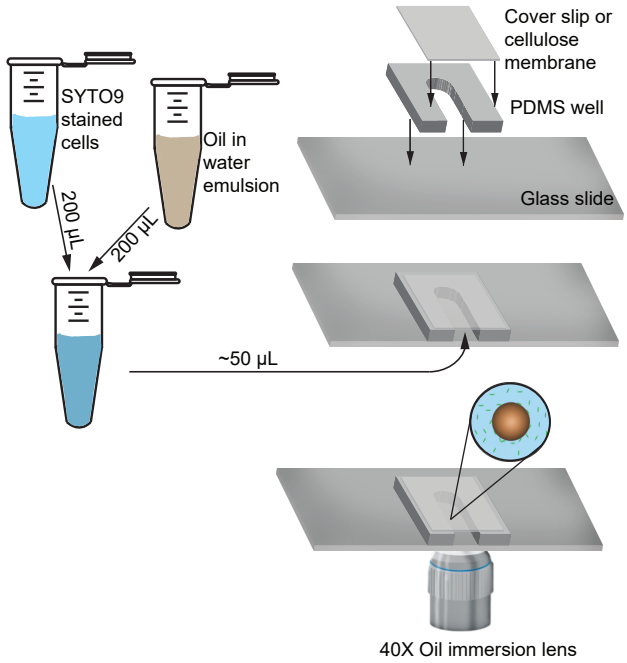

Figure 1: Schematic diagram of experimental steps and imaging setup.

Table 1: Zeta potential of hexadecane droplets in Milli-Q water at various DOSS concentrations. Emulsion droplets were prepared by shaking hexadecane in water (O/W = 1:1000). The standard deviations are calculated from three independent emulsion suspensions.

[DOSS] [ppm]	ζ [mV]	
	-CCCP	+CCCP
2	-56 ± 4	-73 ± 2
20	-67 ± 3	-72 ± 1
50	-71 ± 4	-70 ± 10
100	-79 ± 2	-85 ± 3
150	-90 ± 7	-88 ± 6
200	-88 ± 15	-93 ± 3

Table 2: Zeta potential of *Halomonas titanicae* in Milli-Q water at various DOSS concentrations.

[DOSS] [ppm]	ζ [mV]
0	-51 ± 2
2	-58 ± 2
20	-50 ± 2
50	-47 ± 2
100	-46 ± 2
150	-47 ± 1
200	-45 ± 2

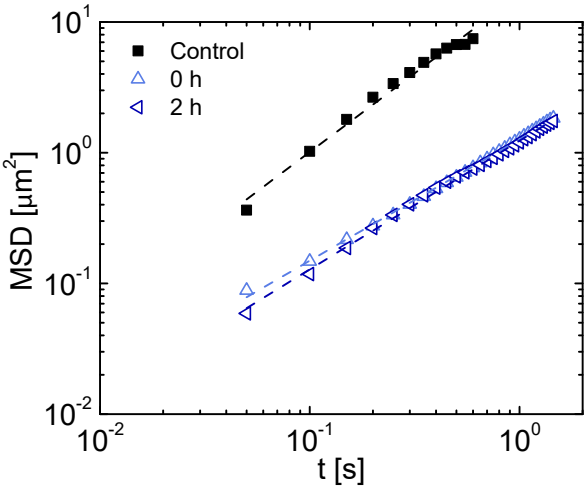

Figure 2: MSD of *H. titanicae* without mechanically shearing (control), immediately after mechanically shearing (0 h), and two hours after mechanically shearing (2 h). The optical density of cell suspension was 0.2 and the DOSS concentration was 2 ppm.

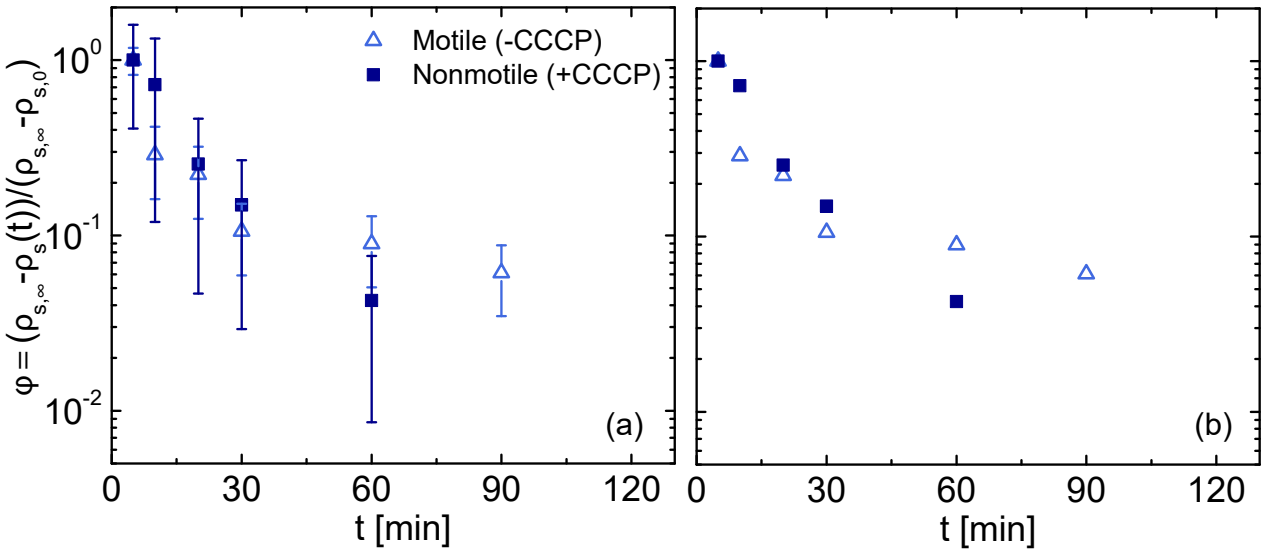

Figure 3: Normalized interfacial density of cells adhered on 20 μm hexadecane droplets as a function of time for motile (-CCCP) and nonmotile (+CCCP) *H. titanicae* (a) with and (b) without error bars. The DOSS concentration in suspension was 2 ppm. The error bars are calculated by propagating the error from each term.

Surface concentration and surface area per molecule of surfactant at CMC

The surface concentration of a surfactant is calculated using equation $\Gamma = -\frac{1}{nRT}\left(\frac{\partial\sigma}{\partial \ln C}\right)_{T,P}$, and surface area per molecule is $A_a = \frac{1}{N_A\Gamma}$, where $n = 1$ when electrolyte is present, R is gas constant, T is temperature, σ is interfacial tension, C is concentration of surfactant, and N_a is Avogadro's number.[1,2] The partial derivatives are $\left(\frac{\partial\sigma}{\partial \ln C}\right)_{T,P}$ = -7.9 mN m^{-1} in absence of CCCP

$\left(\frac{\partial\sigma}{\partial \ln C}\right)_{T,P}$ = -5.5 mN m^{-1} in presence of CCCP At T = 298 K, the surface concentration of DOSS is 3.2 $\times 10^{-6}$ mol m^{-2} in the absence of CCCP, and 2.2 $\times 10^{-6}$ mol m^{-2} in the presence of CCCP. The surface areas per molecule are 52 and 75 $\mathring{A}^2$ for in absence and in presence of CCCP, respectively.

References

(1) Defay, R.; Bellemans, A.; Prigogine, I. *Surface tension and adsorption*; Longmans, 1966.

(2) Moroi, Y. *Micelles: theoretical and applied aspects*; Springer Science & Business Media, 1992.