

Figure 1: The ensemble mean-squared displacement (MSD) of 1 micron size colloids as a function of lag time at various interface ages from the formation of the oil-aqueous interface. At the earliest age, the colloids move superdiffusively in the presence of active bacteria. Later ages show the final stages of a viscoelastic transition. These measurements come from a single trail and the black dashed line shows the experimentally measured ensemble mean-squared displacement of colloids at the neat oil-water interface. The superdiffusive MSD was, unfortunately, distorted by uneven convective drift. Correcting for uniform (affine) drift is standard practice in microrheology experiments, but it is not as effective when currents are nonuniform over the field of view. In the experiment addressed in the main text, drift was less of a factor.

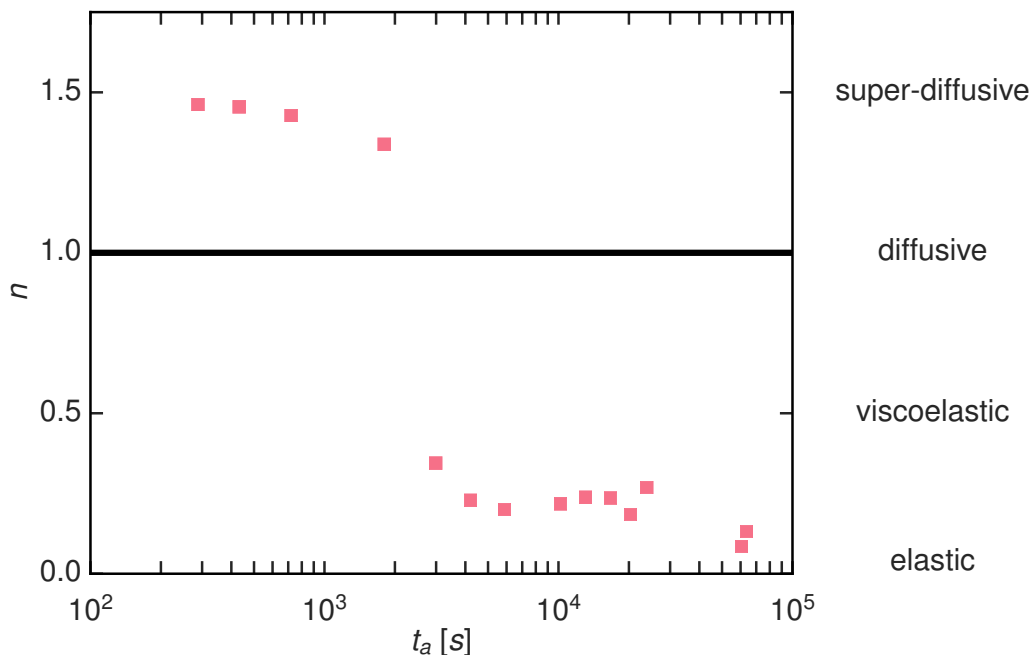


Figure 2: Evolution of the slope of ensemble averaged mean-squared displacements of particles at an interface between an aqueous suspension of *Pseudomonas aeruginosa* PA01 bacteria and hexadecane. Consistent with the trends observed with the *Pseudomonas sp.* P62 discussed throughout this paper, these particles exposed to PA01 initially experienced a superdiffusive environment; eventually displaying viscoelasticity, and finally, essentially elastic behavior.

Video 1 shows a perpendicular observation of the interface shortly after formation with a TEM grid floating in the field of view (80 micron bar width). Dark spots are primarily Invitrogen particles used for particle tracking - occasionally, bacteria trapped at the interface by one pole appear similarly dark. Bacteria are trapped both by a pole and in the plane of the interface. Those moving in the plane of the interface, and the bacteria swimming below, buffet the colloidal particles in their vicinity.

Video 2 accompanies Fig. 7 in the manuscript. A hexadecane oil drop was aged in the bacterial suspension for ~ 22 hours, and the oil was subsequently withdrawn. This video shows the withdrawal process which compresses the film at the interface, decreasing the interfacial tension, eventually allowing the film to slacken and wrinkle. The critical wavelength of the newly formed wrinkles led to the estimation of bending energy. The needle is 0.9081 mm in diameter.

Video 3 is a hexadecane oil drop aged at the same time as a planar oil film above, against the bacteria suspension. When the oil drop was raised to the film and pressed against it, the oil drop did not rupture. It was able to deform significantly without coalescing with the oil phase above. Though not shown, the oil drop was subsequently completely removed from contact with the planar film without any apparent disturbance to the film on the drop.