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Bioemulsification of hexadecane by Marinobacter sp17[1] GEORGE KAPELLOS, Massachusetts Institute of Technology, NICOLAS KALOGERAKIS, Technical University of Crete, PATRICK S. DOYLE, Massachusetts Institute of Technology — The ability of the halotolerant microbes Marinobacter sp17 to emulsify hexadecane and form biofilms over the surface of dispersed hexadecane droplets is investigated in batch and microfluidic microcosms. In batch microcosms, these microbes transform a layer of hexadecane, initially floating over seawater, to a highly polydisperse oil-in-water emulsion. The evolution of the droplet size distribution is followed by microscopic image analysis and dynamic light scattering measurements and is found to be multimodal with peaks over a range spanning from hundreds of nanometers up to several millimeters. Over time, the average droplet diameter is reduced by the combined effects of biodegradation and accumulating emulsification capacity. The droplet shrinking that is caused by biodegradation alone, is also determined for individual hexadecane droplets using a custom-made microfluidic device and phase-contrast microscopy. Furthermore, the structure of the microbial biofilms that coat and degrade hexadecane droplets is visualized and quantified with confocal microscopic imaging. Experimental results are discussed in conjunction with a recently developed compound particle-in-cell model.

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