

Abstract Submitted
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Experimental Fluidic Investigation of Degradation of Pico-liter Oil Droplets by Physical and Biological Processes MARYAM JALALI, JIAN SHENG, Texas A & M Univ — This study used laboratory experiments to assess degradation of crude oil by physical and biological processes including dissolution and consumption. To perform this study, we have developed a bioassay that consists of a flow chamber with a bottom glass substrate printed with an array of pico-liter oil droplets using micro-Transfer Printing. The technique allows the printing of highly homogeneous pico-liter droplet array with different dimensions and shapes that can be maintained for weeks. Since the droplets are pinned and stationary on the bottom substrate, the key processes can be evaluated by measuring the change of shape and volume using Atomic Force Microscopy. Parallel microfluidic bioassays are established at the beginning, exposed to abiotic/biotic solutions, and scarified for characterization at given time intervals for each experiment. Two processes, dissolution and consumption, are investigated. In addition, the effects of dispersant on these processes are also studied. The results show that the amount of oil degraded by bacteria accounts for almost 50% of the total volume in comparison to 25% via dissolution. Although dispersant has a subtle effect on dissolution, the effect on rates of consumption and its asymptotic behavior are substantial. Experiments involving different bacterial strains, dispersant concentration, and flow shear rate are on-going.

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