Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Delayed coalescence of surfactant drops MYRTHE BRUNING, MAXIME COSTALONGA, University Twente, STEFAN KARPITSCHKA, Max-Planck-Institut für Dynamik und Selbstorganisation, Göttingen, JACCO SNOEIJER, University Twente — When two drops of the same liquid meet, they merge into one drop to minimize their surface. However, the coalescence behavior can be differentif the drops have different compositions, hence different surface tensions. Instead of merging, frequently a non-coalescence behavior is observed, and one drop may chase the other. Here we study the coalescence of surfactant solutions on a substrate. By varying both their contact angle θ and their difference in surface tension $\Delta\gamma$, a phase diagram is constructed, displaying several regimes with distinct timescales of non-coalescence. In all regimes the drop with lower surfactant concentration is pushed forward by the other drop. We show that the behavior not only depends on θ and $\Delta\gamma$, but also on the surfactant concentrations of the two drops. The lifetime of the non-coalescence state of a pure water and a surfactant drop is much larger than for two surfactant drops, even if θ and $\Delta\gamma$ are identical in both cases. We explain this from a competition between surfactant advection and desorption. In the case of two surfactant drops, surfactants accumulate at the surface of the downstream drop, reducing the surface tension difference and thereby the duration of the non-coalescence state.

Myrthe Bruning
University Twente

Date submitted: 24 Jul 2017 Electronic form version 1.4