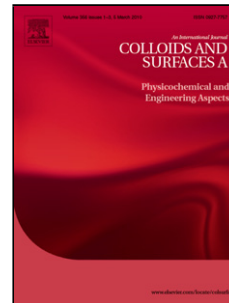


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Forced dewetting dynamics of high molecular weight surfactant solutions

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Abstract

The dewetting behavior of surfactant solutions differs from pure liquids due to the possibility of generating Marangoni stresses near the receding contact line. Specifically, for surfactant solutions the dynamic receding contact angle decreases much stronger with increasing dewetting speed than of pure liquids with similar viscosity and surface tension. To gain a better understanding of the correlation between the dynamics of dewetting and the properties of the surfactants (e.g. surface activity, micelle formation, surface rheology) we compare high molecular weight surfactants to low molecular weight surfactants. We investigate the forced wetting of aqueous solutions of Pluronic F-127 (a {poly-ethylene-oxide}-{poly-propylene-oxide}-{poly-ethylene-oxide} triblock copolymer), with a molecular weight of $M_w=12$ kg/mol, roughly 50 times larger than an average size surfactant, like cetyltrimethylammonium bromid (CTAB). Pluronic F-127 is more surface active than CTAB and already a nanomolar concentration affects the surface tension. Similar to smaller surfactants Pluronic F-127 decreases the dynamic receding contact angle. However, the change in the dynamic receding contact angle is more pronounced. In case of Pluronic F-127 already concentrations below 0.1 %CMC (critical micelle concentration) led to a substantial decrease in dynamic receding contact angle. With a combination of dewetting experiments, surfaces rheology and bulk measurements of aggregate concentrations, we show that the concentration of full surface coverage (CFSC) is the relevant concentration scale. Only in the case of low molecular weight surfactant this concentration is close to the critical micelle concentration (CMC). In the case of Pluronic F-127 the CFSC and the CMC differ by about three orders of magnitude.

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