Oil-water separation in the presence of production chemicals

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Publication date:
2022

Document Version
Publisher's PDF, also known as Version of record

Oil-Water Separation in the Presence of Production Chemicals



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Research Area: PW Treatment

Abstract

Production chemicals are always part of the oil treatment operation units. The film forming corrosion inhibitors, soluble in water phase, are among these chemicals. This can hinder the water-oil separation process by formation of emulsion. In this study, gravity settling technique combined with droplet size measurements using microscope were used to investigate the separation process in model oil-brine system with different chemicals.

Objective

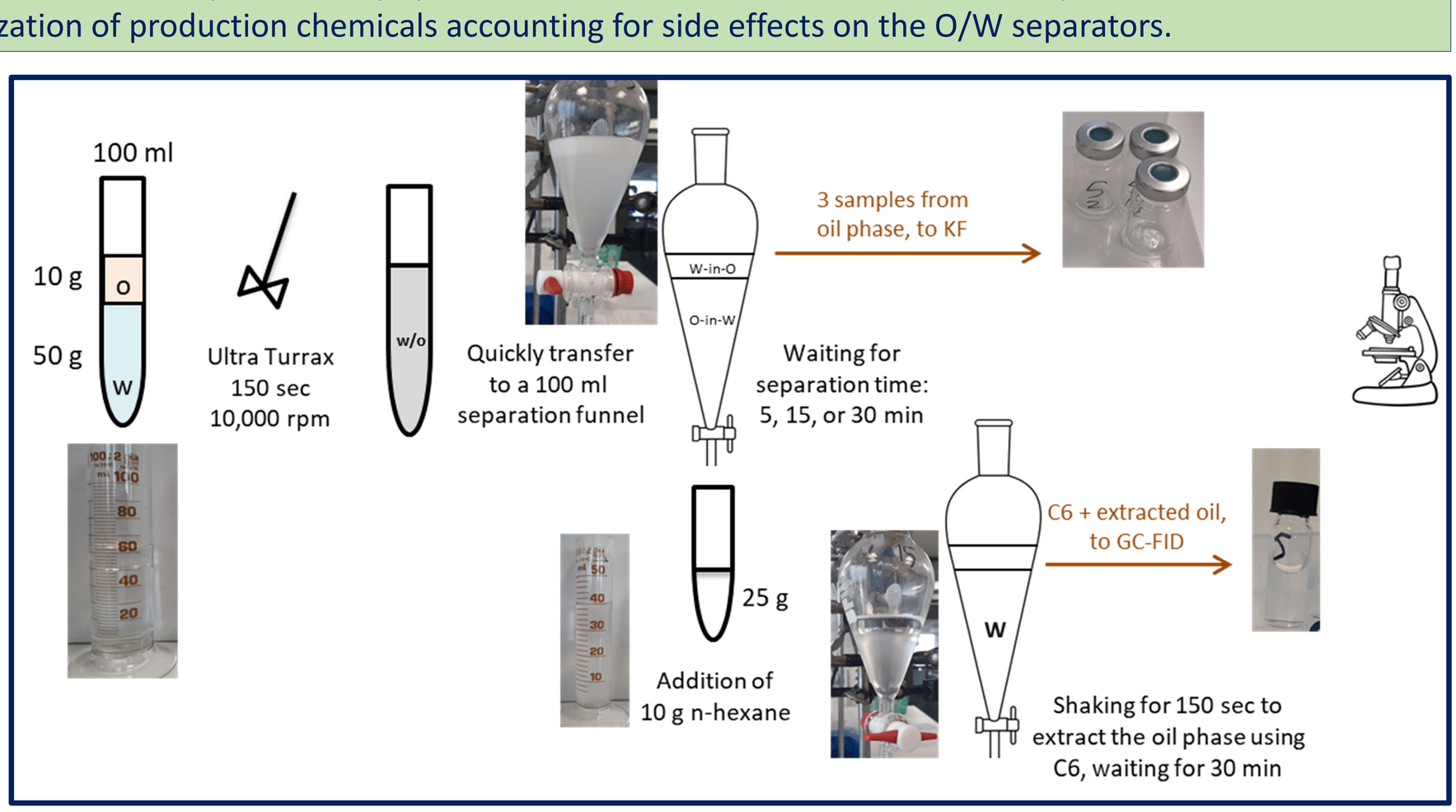
To investigate the effect of production chemicals on the oil-water separation in gravity settlers is the main objective of this work. The kinetic data of O/W separation in the presence of production chemicals with the droplet size distribution measured by microscope in this work can be used in development of a physicochemical model to include the effect of production chemicals. This can be used in selection/optimization of production chemicals accounting for side effects on the O/W separators.

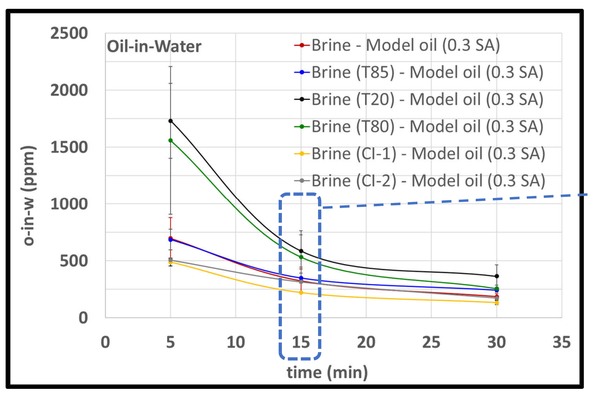
Systems

Model oil (MO) / brine only
MO / brine + T 85 (HLB 11)
MO / brine + T 80 (HLB 15)
MO / brine + T 20 (HLB 16.7)
MO / brine + CI-1
MO / brine + CI-2

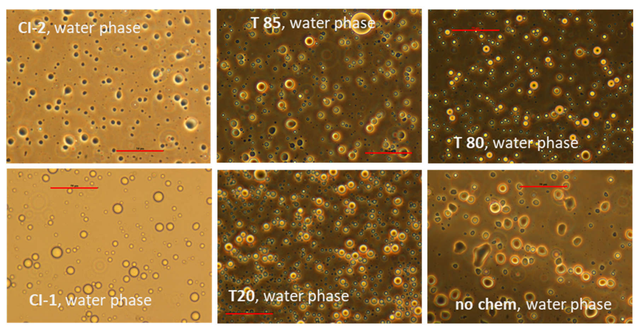
Model Oil (MO)

C10/C12 (equal wt.%) +
Stearic Acid (0.3 g /100 g oil)

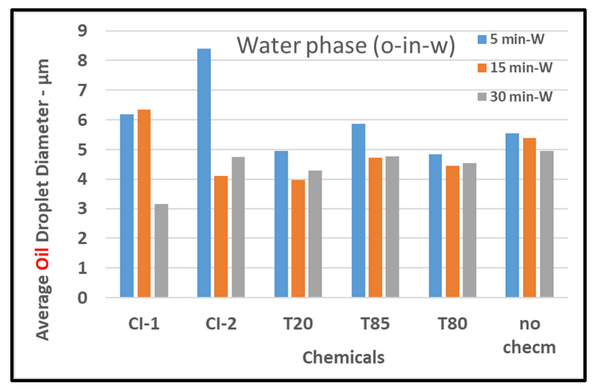




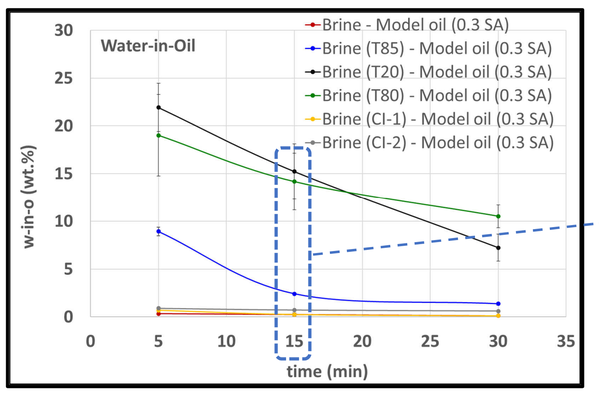
The concentrations of o-in-w (above) and w-in-o (below) after different residence times in model oil-brine systems containing water-soluble chemicals and a system with no added chemical.

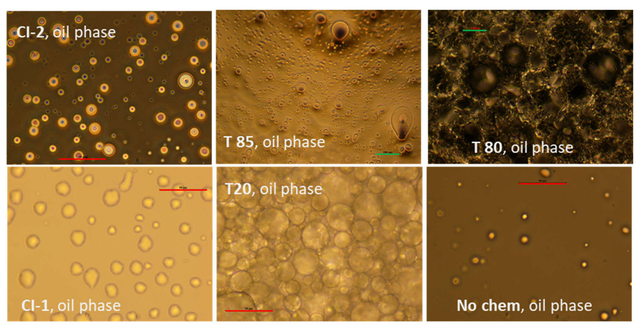


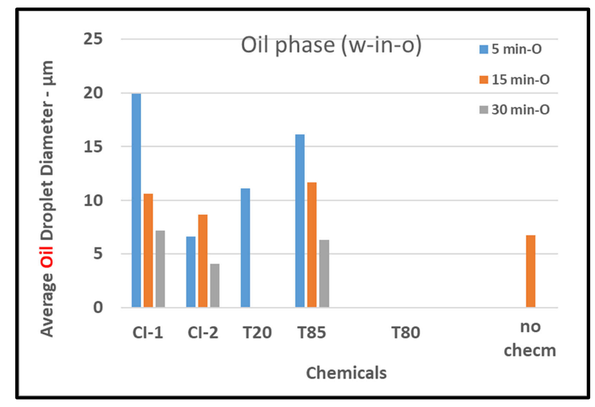
Microscopy images related to the w/o separation after 15 min. The samples in these images were taken from water phase (above) and oil phase (below). The scales are shown on each image, equal to 50 µm (red) or 100 µm (green).



Average oil (above) and water (below) droplet sizes for each system at different residence times







Conclusions

Separation results combined with microscopy observation are available for six different systems: 3 Tweens, 2 CIs and 1 system without production chemical. Tween family increased both the o-in-w and w-in-o more than other systems. Both CIs showed o-in-w contents near to the one with brine only system (no production chemicals). As expected, a trend between HLB (in Tweens and brine only) and the phase separation was observed. It was also observed that in water phase, the dominant parameter in separation is the droplet size, but in oil phase, the separation cannot be correlated with droplet size only and coalescence rate has effect as well.