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# Emulsification of viscous alkyd resin by catastrophic phase inversion with nonionic surfactant

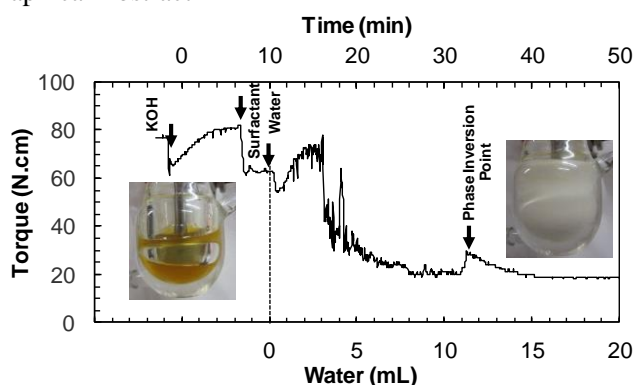
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Graphical Abstract



## HIGHLIGHTS

- Addition of water to alkyd resin produces the emulsion change from W/O to O/W
- Catastrophic phase inversion was detected by monitoring both torque and conductivity
- Different torque profiles are observed depending on the resin neutralization level

## Abstract

The addition of water to hydrophobic alkyd resin containing a hydrophilic nonionic surfactant (polyethoxylated-20-oleyl alcohol) was used to produce the emulsion morphology change from W/O to O/W in a small thermostated reactor (50 mL). The so-called catastrophic phase inversion of the water/alkyd resin system was detected by monitoring both, the viscosity by torque measurement and the electrical conductivity, until an equal weight fraction of water and resin is attained ( $f_w = 0.5$ ). The two methods provide similar values of the phase inversion point (PIP). Although the determination of the PIP exhibits a small inaccuracy, it is clear that different torque profiles and PIP are observed depending on the resin neutralization level, the surfactant concentration and the water addition rate. For the non-neutralized resin, both, PIP and emulsion drop size, decrease with surfactant concentration increase. The completely neutralized resin could be emulsified using a minimum of 2 wt% of surfactant in the final emulsion. In such a case the water fraction at which inversion occurs ( $f_{w,Inv} = 0.36$ ) is independent of the surfactant concentration and a small resin drop diameter ( $< 200$  nm) can be obtained. A more

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