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ABSTRACT SUBMISSION

Title: Halloysite clay-hydrotrope composites for oil spill mitigation

Abstract No.	1571
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Text Abstract

Novel materials for the oil spill mitigation are highly desirable due to the insufficient efficacy and high ecotoxicity of the known dispersants. Hybrid environmentally friendly dispersants can be formed using nanocontainers with tunable hydrophobicity loaded with biodegradable amphiphiles - hydrotropes. Hydrotropes act as surfactants but instead of micelles, they form short-lived clusters [1,2].

Halloysite clay nanotubes were used as natural abundantly available and cheap containers [3]. Halloysite was modified with water-soluble adsorbates (cetyltrimethylammonium bromide, poly(N-vinylcaprolactam), and polyhexamethylene guanidine hydrochloride), and then calcined at 500 - 600 °C to produce the hydrophobized carbon-coated clay nanotubes. The hydrophobized halloysite was then loaded with various hydrotropes and used as dispersant. The emission kinetics of low molecular amphiphiles were studied by refractometry, the dynamic interfacial tension was measured by spinning drop method, and the emulsifying action was assessed by the optical microscopy of oil-in-water emulsions stabilized with the synthesized dispersants. Raw Van-Yogan oil was used at concertation of 20 wt % in aqueous 3.5 wt % NaCl solutions and halloysite nanoclay was added at 0.8 wt %.

Hydrotropes are released from these tubule nanocontainers in 50-100 minutes at temperatures from +4 to +20 °C. In the presence of hydrotropes, the interfacial tension between oil and simulated seawater decreases, resulting in more favorable small droplet oil dispersions. We found that the combination of hydrotrope (tert-butanol or butoxyethanol) and hydrophobized clay nanotubes ensures the formation and stabilization of oil-in-water emulsion with small droplets (described with lognormal distribution; mode less than 20 μm).

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