EVALUATION OF THE EFFECT OF NANOPARTICLE ADDITION INTO THE GEMINI SURFACTANT ON RHEOLOGY AND WAX DEPOSITION OF MALAYSIAN CRUDE OIL

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Abstract:
Crude oil is a fossil fuel formed from the decomposition of decaying plants and animals in the round. In crude oil, there is a high percentage of asphaltenes that leads to wax deposition long the transport pipeline. The objective of this research is to study the effect of temperature, hear rate and nanoparticles loadings towards the viscosity, interfacial tension, surface tension as well as the weight of wax deposit form. Two types of nanoparticles were used in this study, which are GOHSENX Anionic PVOH L-3266 and NICHIGO G-polymer AZF8035W, while Gemini YND1233 was used as a surfactant. Nanoparticles with different amount of loadings (2mg, 3mg, 4mg and 5mg) was prepared using cyclohexane as the solvent. The nanofluid is prepared in the load ratio of Gemini surfactant to nanoparticles of 3:1. With 5mg of nanoparticles, L-3266 loadings in Gemini surfactant showed the best performance where it provides the lowest viscosity, interfacial tension, surface tension and wax deposition as compared to the 2mg of nanoparticles AZF8035W loadings in Gemini surfactant. This is due to the carboxylic acid group present in AZF8035W. The optimum temperature and shear rate in reducing the crude oil viscosity was obtained at 35 o C and 80 rpm. To investigate the effect of nanoparticle loading and the stirring rate of impeller on the wax deposit formation, the cold finger test had been conducted. From cold finger analysis, the least weight of wax deposit was obtained at 20oC of cold finger temperature and 500 rpm of stirring rate by adding 5mg of nanoparticles L-3266 in Gemini surfactant. As a conclusion, the best performance of wax inhibitor from this research was obtained by adding 5mg of nanoparticles GOHSENX Anionic PVOH L-3266 in Gemini surfactant in order to improve the rheology of the crude oil and decrease the formation of wax deposition.

Keywords: Crude oil ; Nanoparticles ; Gemini surfactant ; Interfacial tension; Cold finger ; Viscosity ; Inhibitor ; Wax deposition

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