

Polymer and Nanoparticle Interaction with Heavy Crude Oil to Enhance Oil Recovery

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Chemical enhanced oil recovery is a process of recovering more than two-third of the crude oil which cannot be obtained by conventional primary or secondary methods. The current study aimed at the interaction of polymer and silica nanoparticles with heavy crude oil to enhanced properties which are responsible for higher oil recovery. The stability of the nanoparticles in the xanthan gum polymer solution was identified by particle size and zeta potential analysis. The reduction in interfacial tension (IFT), emulsification of crude oil, creaming rate, rheology properties and wettability alteration of the system for polymer-nanoparticles synergy were investigated and based on which an optimum concentration of 5000 ppm xanthan gum and 0.3 % silica nanoparticles were obtained. Polymer-nanoparticles aqueous chemical solution were effective in reducing the IFT which promotes stable oil-water with average droplet size in the range of (5.12 - 7.52 μm). High creaming index (lower creaming rate) was obtained for all nanoparticles system both at room temperature and elevated temperature (80°C). Similarly nanoparticles enhances the viscosity of the system and indicates the gel behavior nature of the solution in bulk phase. The change in contact angle from 86.2 to 18.8°C results in wettability alteration of the system from intermediate wet to water wet. The core flooding experiments performed resulted in oil recovery of 21% at 30°C and 19% at 80°C which clearly indicates the effective performance of silica nanoparticles at elevated temperature.

Biography:

Rahul Saha is a researcher scholar in the Department of Chemical Engineering, Indian Institute of Technology Guwahati, India. His research area focuses on chemical enhanced oil recovery (Chemical EOR) techniques which involves detail characterization of crude oil, adsorption behavior, interfacial interaction phenomena, emulsification, creaming behavior, rheology, wettability alteration and additional application of nanoparticles in the system. He did his Bachelor from Pune University and Masters from Indian Institute of Technology Guwahati, India. His Master's degree dissertation involved sonication assisted biodiesel preparation from non-edible oil sources. Till date, he has published seven international journal publications in peer reviewed journals of repute.