

Abstract

This study indicated how coating of the nanoparticles with asphaltenes and resins tends to modify the stabilization profile compared to others obtained without coating. This work focused on Crude oil Emulsions stabilized by means of silica nanoparticles. The impact of the modification of the pulverized clay particle surface has been examined with the help of infra red (IR) spectroscopy, contact angle measurements. The stabilization efficiency was greatly enhanced by adsorption of crude oil components onto very hydrophilic or very hydrophobic silica. Resulting stabilizing mechanisms have been elucidated. The study also captured somewhat dangerous phase inversion of emulsions stabilized by particles with intermediate wetting properties, induced by simply increasing the volume of the dispersed phase. In all situations, the stability to gravitational induced separation (coalescence) gets through a lowest value approaching inversion in line with a highest value in drop size of the disperse phase. Specific transitional phase inversion from o/w to w/o emulsion type can be obtained by modification of the hydrophilicity of the particles, either by silylation or by a controlled coating with heavy components from crude oil. The importance of this research for field processing of petroleum systems is stressed.

Keywords: Asphaltenes, Adsorption, Silica particles, Wettability, QCM-D, Inversion, Emulsion stability.