

Calculating Asphaltenes Precipitation Onset Pressure by Using Cardanol as Precipitation Inhibitor: A Strategy to Increment the Oil Well Production

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Abstract : Asphaltenes precipitation is considered as a formation damage problem, which can reduce the oil recovery factor. It fouls piping and surface installations, as well as cause serious flow assurance complications and decline oil well production. Therefore, researchers have shown an interest in chemical treatments to control this phenomenon. The aim of this paper is to assess the asphaltenes precipitation onset of crude oils in the presence of cardanol, by titrating the crude with n-heptane. Moreover, based on this results obtained at atmosphere pressure, the asphaltenes precipitation onset pressure were calculated to predict asphaltenes precipitation in the reservoir, by using differential liberation and refractive index data of the oils. The influence of cardanol concentrations in the asphaltenes stabilization of three Brazilian crude oils samples (with similar API densities) was studied. Therefore, four formulations of cardanol in toluene were prepared: 0, 3, 5, 10 and 15 m/m%. The formulations were added to the crude at 2:98 ratio. The petroleum samples were characterized by API density, elemental analysis and differential liberation test. The asphaltenes precipitation onset (APO) was determined by titrating with n-heptane and monitoring with near-infrared (NIR). UV-Vis spectroscopy experiments were also done to assess the precipitate asphaltenes content. The asphaltenes precipitation envelopes (APE) were also determined by numerical simulation (Multiflash). In addition, the adequate artificial lift systems (ALS) for the oils were selected. It was based on the downhole well profile and a screening methodology. Finally, the oil flowrates were modelling by NODAL analysis production system in the PIPESIM software. The results of this study show that the asphaltenes precipitation onset of the crude oils were 2.2, 2.3 and 6.0 mL of n-heptane/g of oil. The cardanol was an effective inhibitor of asphaltenes precipitation for the crude oils used in this study, since it displaces the precipitation pressure of the oil to lower values. This indicates that cardanol can increase the oil wells productivity.

Keywords : asphaltenes, NODAL analysis production system, precipitation pressure onset, inhibitory molecule

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