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Assessment of asphaltene stability at different temperatures using salicylic and iso-phthalic acids as inhibitors

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ABSTRACT

During crude oil production, processing, transportation and storage, the change in temperature, pressure and fluid composition can lead to the instability of asphaltene in the system. The posterior deposition of asphaltene can clog or completely close the production, processing, and transportation facilities, thus decreasing production and increasing maintenance costs. A cost-saving manner to prevent this problem is the use of processes such as addition of chemicals inhibitors, which prevent asphaltene precipitation. In this project, several experiments were performed to assess the stability of asphaltene in crude oil varying parameters as temperature, precipitant amount, inhibitors concentrations and time.

The asphaltene behaviour and the reduction of the precipitated particles size in crude oil samples were controlled using an optical microscope. In order to propose a preventive method for the asphaltene deposition, different amount of Salicylic and Iso-Phthalic acids as asphaltene inhibitors and n-heptane as asphaltene precipitant agent were added at 35 ºC, 65 ºC, and 80 ºC. The results showed that the sizes of the asphaltene particles were reduced with increase in temperature.

At almost room temperature such as 35 ºC, the inhibition of Salicylic acid was better for lower concentration (15%). While at higher temperature such as 65 ºC and 80 ºC, the best inhibition concentration for Salicylic acid was 25%. For Iso-Phathalic acid, at 35 ºC it was found that 25% was the best concentration, at 65 ºC, 20% was the best concentration, and at 80 ºC, small concentration of 2.5 % was sufficient to inhibite asphaltene in the crude oil. The precipitant agent n-heptane had an effect on the size of asphaltene aggregates. A minimum of 2 ml n-heptane was able to initiate the precipitation process at various temperatures (35 ºC, 65 ºC and 80 ºC). An increase in precipitant agent amount such as 3.5 ml increased the aggregates particle sizes.

It was concluded that asphaltene is more stable at 80 ºC for Salicylic acid, showing the best inhibition capacity at this temperature, when compared to Iso-Phthalic acid which showed the best inhibition capacity at 65 ºC, for both inibitors asphaltene showed to be more instable at 35 ºC. The inhibition profile of Salicylic acid showed less variation with temperature than the inhibition of Iso-Phathalic acid.