

A Novel Experimental Technique for Determination of Asphaltene Instability in Crude Oils

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Asphaltenes are well-known for their tendency to precipitate and deposit during production of reservoir crude oils. Asphaltene precipitation determination is a key step in studying the asphaltene deposition problems since precipitation is a necessary condition for the asphaltenes to deposit. The methods developed so far (direct methods) to measure the onset of asphaltene precipitation require a minimum particle size - usually from about 0.5 to 1 μm . This means that asphaltene onset detection by direct methods can only occur after precipitated asphaltenes aggregate to exceed the detection limit. In this work, a novel experimental technique called "Indirect Method" is used for studying asphaltene precipitation on both model oil and real crude oil systems. This method, which is a combination of gravimetric and spectroscopy techniques, is proposed for determination of the asphaltene precipitation onset as well as the amount precipitated. The results obtained in this study show that the indirect method has three main advantages over direct methods. First, it can be applied for determination of both the onset and the amount of asphaltene precipitation. By having a proper calibration curve, the absorbance of the supernatant fluid after centrifugation step, can be easily and accurately related to the amount of precipitated asphaltene. Also, the indirect method can be used for crude oils ranging from very low to high asphaltene content; model oils studied in this work contained 0.1 wt% asphaltenes (considered as a low concentration) to 5 wt% asphaltenes (considered as a high concentration). Finally, the minimum particle size detected with the indirect method is smaller than with the direct methods, making the indirect method more sensitive to the size of precipitated asphaltene particles.