Experimental Viscosities and Densities of CO2-Crude Oil Mixtures Up to 453 K and High Pressures Using a Vibrating-Wire Viscometer and Vibrating-Tube Densimeter

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With the increasing maturity of conventional oil resources and limited volumes of new conventional resources to replace production, attention has been focused on viscosity reduction to enhance oil production from brown-field reservoirs by the injection of light gases such as CO2. Also, viscosity plays a significant role in managing and controlling injection of CO2 into depleted oil reservoirs or saline aquifers for the purpose of carbon sequestration. In this study, an experimental measurement on viscosity and density of mixtures of crude oils and CO2 was performed using accurate technique such as vibrating-wire viscometer. However, for viscosity measurements involving crude oil using vibrating-wire viscometer, asphaltene precipitation and deposition can be a problem. This problem can have effects on the viscometer sensor, flow lines and fittings and introduced a significant error that can affect the accuracy of the results. Therefore, the ASTM recommended procedure (ASTM2007-80) for separating asphaltene was modified to obtain representative crude oils free of asphaltene. The range of temperature was (273.18 to 453) K while that of pressure was (0.1 to 130) MPa. The experimental data will be used for modelling of the viscosity of crude oil + CO2 at elevated pressure and temperature using appropriate model for improved prediction of the CO2-crude oil mixture under persistently changing conditions of composition, pressure, temperature and conditions common with reservoir fluids.