

## **Rheological Study on Squalane and Its Mixtures with CO<sub>2</sub>**

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The effect of temperature and pressure on the viscosity of squalane and its mixtures with carbon dioxide has been the subject of recent renovated interest. This research is motivated by the idea of establishing squalane as a reference fluid for the calibration of high-pressure viscosity devices. The purpose of this work is to expand the available viscosity data, to study its rheological behavior, and to provide an accurate viscosity model for the reproduction of the data in the range of conditions of application and interest. To carry out the measurements, a high-pressure capillary rheometer has been designed and constructed for operation from ambient conditions up to 353 K and 30 MPa, and variable shear rates. The shear rate can be adjusted by varying the capillary diameter and the volumetric flow rate. The rheometer is equipped with a mixing device to ensure gas saturation in order to facilitate the unperturbed transfer of the saturated fluid into the measurement chambers and capillaries. Due to its working principle, the capillary rheometer requires a pressure drop to realize the flow. Therefore, measurements near the phase boundary may lead to bubble formation. In order to avoid undesired vapor phase formation, the measurements are carried out above the estimated saturation pressure. Some early experimental work indicates that squalane has a shear thinning behavior at very high pressures. This is further investigated by measuring the viscosity of pure squalane and its mixtures with carbon dioxide under high-pressure and a range of high shear rates. If squalane is to be used as a high-pressure viscosity calibration fluid, its Newtonian behavior within possible ranges of operation must be fully verified. The obtained results are finally compared with other literature data and a friction theory based model for the pure compounds and mixtures with CO<sub>2</sub> is also presented.