

Interfacial Tension of CO₂-POE and CO₂-PVE Mixtures

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Measurements of the CO₂ interfacial tension with and without coexisting lubricant were undertaken as a part of an investigation of the two phase flow patterns in minichannel tubes (0.5 mm). Measurements have been carried out with pure CO₂ and mixtures of polyolester (POE) and polyvinyl ether (PVE) with CO₂ over the soluble composition range and temperatures from -5 to 50 °C for pressures up to 5.7 MPa. A differential maximum bubble pressure surface tensiometer has been constructed to operate over the temperature range -40 °C to 75 °C and pressures up to 14 MPa. Due to dynamic bubble formation in the tensiometer, inertial, viscous, and additives in the lubricant contribute to a potential measurement error in the interfacial tension measurement if bubble generation frequencies are not controlled to low frequencies. To alleviate these measurement errors, measurements were performed at slow bubble formation frequencies of 2, 1, 0.4 and 0.066 Hz to determine the true interfacial tension for the CO₂-lubricant mixtures. The accuracy of interfacial tension measurements is ±1 % for measurements greater than 25 mN/m; while for measurements less than 25 mN/m, the accuracy is ±0.25 mN/m.

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