

Phase Behaviour of (Propane + H₂O + NaCl): a Study at Reservoir Conditions

Rayane Hoballah^S and J. P. Martin Trusler^C

Chemical Engineering - QCCSRC, Imperial College London, London, United Kingdom
m.trusler@imperial.ac.uk

Abstract:

Technical challenges and safety aspects in measuring the phase behaviour of impure CO₂ mixed with reservoir fluids (hydrocarbons and brines) are numerous. To accommodate these, a new semi-analytical apparatus have been developed to operate safely at reservoir conditions with flammable, toxic and sour gases (including SO₂ and H₂S). The new apparatus has a maximum working pressure of 70 MPa and a maximum working temperature of 473 K, thus unlocking the limitations in temperature and pressure that can be found in the literature. The system is equipped with a novel sampling system for the aqueous phase, coupled with an online gas chromatograph fitted with both thermal-conductivity and flame-ionization detectors. All wetted metallic parts are made of titanium and the entire equipment fits within an extracted enclosure where it can be operated under remote control. This work focuses on the VL and LL phase equilibria of propane with NaCl(aq) at molalities of (0, 1.5 and 3.5) mol·kg⁻¹. This system has been studied at temperatures from (273 to 453) K and at pressure from (0.5 to 19) MPa for the propane-rich phase (gas or liquid) and from (0.5 to 70) MPa for the aqueous phase. The experimental results are compared with the few data available in the literature data and with thermodynamic models.

Acknowledgment

We gratefully acknowledge the funding of QCCSRC provided jointly by Qatar Petroleum, Shell, and the Qatar Science and Technology Park, and their permission to publish this research.