

Measurement and Modeling of the Water Content of Sweet and Acid Natural Gas Systems

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We describe a new flow cell apparatus for measuring the water content of gases up to 120 MPa at 490 K, that uses a combination of gravimetric and electrical resistance techniques to determine the solubility of water in the gaseous phase. The new experimental data for the solubility of water in supercritical methane, ethane and methane-carbon dioxide mixtures obtained with our apparatus spans pressures from 3.4 to 110 MPa covering a temperature range from 310 to 477 K.

We model the experimental results by combining two equations of state; vapor phase fugacities and fugacity coefficients are calculated with a modified Peng-Robinson equation of state and aqueous phase fugacities and fugacity coefficients are calculated using an equation by Wagner and Pruss (J. Phys. Chem. Ref. Data 2002,**31**, 387-535). We compare the model results with new and existing experimental data, and with commercially available simulators. Our model reproduces the experimental data within 2-6% using one adjustable parameter, indicating that the predictions of the model are equal to or superior to the commercially available simulators.