

## Solubility of Water in CO<sub>2</sub> Mixtures at Pipeline Operation Conditions

**Authors :** Mohammad Ahmad, Sander Gersen, Erwin Wilbers

**Abstract :** Carbon capture, transport and underground storage have become a major solution to reduce CO<sub>2</sub> emissions from power plants and other large CO<sub>2</sub> sources. A big part of this captured CO<sub>2</sub> stream is transported at high pressure dense phase conditions and stored in offshore underground depleted oil and gas fields. CO<sub>2</sub> is also transported in offshore pipelines to be used for enhanced oil and gas recovery. The captured CO<sub>2</sub> stream with impurities may contain water that causes severe corrosion problems, flow assurance failure and might damage valves and instrumentations. Thus, free water formation should be strictly prevented. The purpose of this work is to study the solubility of water in pure CO<sub>2</sub> and in CO<sub>2</sub> mixtures under real pipeline pressure (90-150 bar) and temperature operation conditions (5-35°C). A set up was constructed to generate experimental data. The results show the solubility of water in CO<sub>2</sub> mixtures increasing with the increase of the temperature or/and with the increase in pressure. A drop in water solubility in CO<sub>2</sub> is observed in the presence of impurities. The data generated were then used to assess the capabilities of two mixture models: the GERG-2008 model and the EOS-CG model. By generating the solubility data, this study contributes to determine the maximum allowable water content in CO<sub>2</sub> pipelines.

**Keywords :** carbon capture and storage, water solubility, equation of states, fluids engineering

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