The Challenges of Determining Reliable Thermophysical Properties Required for CO_2 Carbon Capture and Storage.

Jefferson Creek [C, S]
Department of Chemical & Biological Engineering, Colorado School of Mines, Golden, CO, U.S.A.
Rice University, Houston, TX, U.S.A.
Letton Hall Group, Houston, TX, U.S.A.
JLCreek70@gmail.com

One primary way to reduce the carbon footprint of our hydrocarbon energy usage to drive modern technology is to capture the "greenhouse gases" produced by car, cattle, and heavy industry. Carbon dioxide is usually identified as one of primary offenders contributing as a "greenhouse" gas to "global warming." One of the more important processes to reduce the amount of carbon dioxide in the atmosphere is to collect the gas from the atmosphere and then to store the gas in salt domes or depleted reservoirs that are the result of consuming the original contents. The transportation of large volumes of CO_2 from collection to storage involves pipelining the carbon dioxide from the collection site to the point where it is injected subsurface.

This presentation will discuss the challenges related to the thermophysical properties required to design CCS (Carbon Capture and Storage) and CO_2 transport systems. Particular focus will be on CO_2+ H_2O fluid mixtures and the water content of the liquid phase CO_2 at temperatures from 223 to 305 K and pressures from 0.35 to 7.50 MPa. The appearance of a water phase at subsea conditions for flowing CO_2 leads to pipeline corrosion problems (hydrates and ice form at 135 kPa and -50°C forms hydrates) as wells as gas at these temperatures and pressures. The liquid phase densities for liquid CO_2 at 10 MPa thermophysical properties of CO_2, and its mixtures in the supercritical region. Every viable application will have to be in the vicinity of the CO_2 critical point, making differences within the experimental data and predictions from thermodynamic models including CO_2 important and will be highlighted and discussed. One can then determine the risks of the transportation of CO_2 and other material to the injection point.