2024 JFES Distinguished Lecture

We are pleased to announce that the forthcoming **JFES Distinguished Lecture** will be held on **May 9th** with the detail as follows. We encourage you all to peruse the below program and register your attendance from the link by May 7th. This event will be held online. The detail will be announced separately after the registration completed.

Date & Time: May-9th, 2024 10:00-11:00 (JST)

Venue: This event is online. The access link is to be informed.

Registration: Registration Form

Program: 2023-2024 SPWLA DISTINGUISHED SPEAKER SERIES

Paper Ref: SPWLA-2023- 0010

Speaker: Jie Wang, Intertek Westport Technology Center/University of Houston, and Christine Ehlig-Economides, University of Houston

Abstract

Dissolution of CO2 in saline waters is considered one of three main CO2 trapping mechanisms, along with structural/stratigraphic trapping and mineralization. CO2 can dissolve in fresh/saline water under typical reservoir pressure and temperatures. Its solubility is dependent on pressure, temperature, and salinity.

The typical assumption in open literatures regarding CO2 solubility studies—that saline water or fresh water is considered as a liquid without any pre-dissolved gases under pressures and temperatures—is not true because any formation water contains appreciable dissolved gases for all pressure and temperature conditions. An example of gas-water ratio (GWR) can be ~1 scf/stb for a saline aquifer and ~5 to 6 scf/stb for formation water in an oil reservoir. Therefore, it is essential to quantify the effect of brine salinity on CO2 solubility in live saline waters. Just as live oil is reservoir oil containing solution gas, “live” brine is defined as saline water with dissolved gases in it.

Two sets of experiments were conducted under typical reservoir conditions. The first set of experiments evaluated the CO2 solubility in live formation water. The second set of experiments evaluated how variation in the live brine salinity affected CO2 solubility. These experiments involved a synthesis of the brine with three different salinities (low, medium, and high), recombination of live formation water, CO2 addition in a high-pressure and high-temperature pressure-volume-temperature (PVT) visual cell, and determination of bubblepoint pressure within the PVT cell.

The results showed that CO2 solubility in live formation water is significantly less than that in “dead” water under reservoir conditions. The CO2 solubility vs. pressure curve has a much steeper slope, which indicates that CO2 can no longer be dissolved in the live brine once it reaches a certain solubility. In addition, the brine salinity affects CO2 solubility in live formation water by further reducing CO2 solubility with increasing live brine salinity.

Understanding CO2 dissolution in live saline water is essential for future carbon capture and sequestration (CCS) evaluation and execution.

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