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Enhanced recovery of shale gas with CO_2 storage in gas-depleted shale

For shale gas development, low recovery factor and greenhouse gas emissions are two important issues. The average recovery factor for shale gas is around 10%, resulting in a large footprint with only a small portion of the resource recovered. Meanwhile, emissions of methane, a potent greenhouse gas could undermine the global efforts of reducing greenhouse gas emissions into the atmosphere. Injection in shale gas fields of CO_2 captured from industrial emitters such as fossil-fuel power plants could increase the recovery of shale gas and achieve CO_2 storage in gas-depleted shale. This could obtain carbon credits and improve the economics for shale gas production. It may also turn gas-depleted shale into a sink of CO_2 and contribute to reduction of greenhouse gas emissions. In shale gas field, methane exists as free gas in void space and as adsorbed gas on organic matter. Injected CO_2 could push the free gas toward the production well and displace the adsorbed gas because CO_2 has a higher tendency to be adsorbed compared to methane. As a result CO_2 is trapped in gas-depleted shale to enable CO_2 storage. CO_2 could also drive out gas condensate that is trapped in the shale and impedes the gas flow. As part of our research on enhanced shale gas recovery with storage of CO_2, we have carried out sorption experiments for CO_2 and methane. The results with samples from a Canadian shale gas reservoir suggest that the shale could adsorb 10 times more CO_2 than methane. That is to say, with every cubic meter of methane produced, 10 cubic meters of CO_2 could be stored. We have also studied swelling of gas condensate by CO_2, which could mobilize the trapped condensate and facilitate the gas flow. Other interesting findings will also be presented.

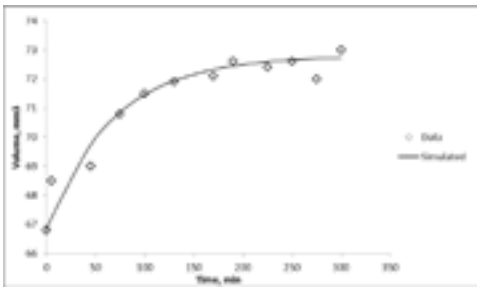

Figure 1: Time dependence of the size of gas condensate drop.

Biography

Jinsheng Wang is a Research Scientist of CanmetENERGY, Natural Resources Canada. His research interest spans several areas, including unconventional oil and gas, greenhouse gas control, clean energy processes, oil processing, etc. He has obtained his BSc from Beijing Institute of Chemical Technology, China, MSc from Institute of Aeronautical Materials, China and PhD from Kyoto University, Japan. He has been working in Natural Resources Canada since 2000.

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