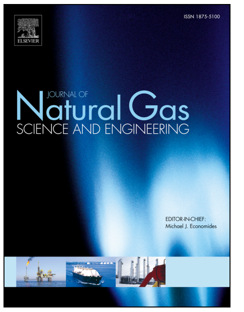

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A mechanism for generating the gas slippage effect near the dewpoint pressure in a porous media gas condensate flow

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This paper presents an experimental study of gas condensate flow in porous media at pressures above the dewpoint pressure. Experimental studies of steady-state flows show that the gas flow rate starts to increase when the pressure significantly exceeds the dewpoint pressure (P = 1.74 P_c). The gas flow rate reaches its peak and is almost 30% higher than that near the critical point ($P=P_c$) at P = 1.5 P_c. Furthermore, the dependence of the gas flow rate on the pressure is non-monotonic and increased flow rates are reached when P = 1.4–1.74 P_c. The effect of wettability on the steady-state flow is considered. Changes in wettability do not increase the gas flow rate in the oleophobic porous media. A significant reduction of the hydraulic diffusivity of the porous medium occurs during unsteady-state flow when the pressure decreases. The observed effects are thought to be driven by formation of stable subcritical condensate nuclei, along with a slippage effect and changes in compressibility. The mechanism of stabilization of subcritical nuclei via combined action of the surface and electrical forces is considered and mathematical models that describe the experimental results are proposed.

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