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Transport properties of gases through composite membranes: An application in gas shut-off

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One of the challenges often faced by operators in the oilfield is the unwanted production of associated gas from oil wells. This is particularly worrisome if the extra gas does not have readily available access to a market, thereby making disposal becomes the only option. Most of the disposal solutions (such as flaring, well injection or liquid conversion) are environmentally unfriendly, technically challenging, and expensive. An alternative method commonly employed by oilfield operators is the gas shut-off. To shut off unwanted gas production in order to optimize the overall reservoir recovery, a wide range of technology is employed including cased-hole wire line, chemical treatments, and thru-tubing services. For problem, which resides near the wellbore, mechanical solutions within the thru-tubing services portfolio often provide the best option. Studies were conducted on gas transport properties of date pit/polysulfone composite membranes for some associated gas components including CO_2, CH_4, N_2, He, and H_2 gases. The composite membranes were prepared by solvent casting method with 2 – 10 wt. percentage date pit micro-sized particles. Gas shut-off performance of the membranes was done using high-pressure gas permeation, X-ray diffraction, and thermo gravimetric analyses. Time-dependent gas control performance properties were evaluated up to a pressure of 40 bar for 75 days. The resulting composite membrane showed the highest decrease in overall gas permeability of 96% with 2wt percentage loading of the particles as compared to pure polysulfone membrane. Thus, the composite membrane possesses some potential for innovative fluid control technology, which can lead to most significant cost reduction and improved oil production.

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