

# Comparison of Non-Darcy Flow of CO<sub>2</sub> and N<sub>2</sub> in a Carbonate Rock

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## Abstract

This work presents the non-Darcy behavior results of CO<sub>2</sub> compared to the previous work using N<sub>2</sub>. This work is based on 85 series of high-velocity gas flooding experiments under high-pressure and high-temperature. Based on experimental results, it was found that pore pressure has more influence on permeability in CO<sub>2</sub> flooding than that in N<sub>2</sub> flooding. In contrast, temperature has definite and consistent influence on both permeability and non-Darcy flow coefficient in N<sub>2</sub> flooding, but the same influence in CO<sub>2</sub> flooding was not observed. Mechanism behind these differences is attributed to physical property differences of the two gases. Much of the work was near the CO<sub>2</sub> critical point or liquid regions. Other anomalies are attributed to thermal effects caused by expansion cooling of the CO<sub>2</sub>. Field data indicates that this phenomenon could be responsible for productivity losses in high CO<sub>2</sub> wells. Accordingly, attention should be paid to avoid flowing CO<sub>2</sub> at conditions near its critical point.