# Corrosion model of $CO_2$ injection based on non-isothermal wellbore hydraulics

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**Abstract**

In this study, the corrosion behaviors of carbon steel and stainless steel are investigated for water-saturated $CO_2$ system to examine the condition of $CO_2$ injection wells in $CO_2$ sequestration and enhanced oil recovery (EOR) operations. In our model, potential nonisothermal effects resulting from $CO_2$ injection activities, including Joule-Thomson effect, heat transfer between $CO_2$ stream and surrounding well/rock formation, the adiabatic (de-) compression of $CO_2$, and the frictional losses, are accounted. The model is applied to onshore and offshore wells using realistic data. In the offshore well, the depth is considered to vary as a power function of lateral distance from the sea floor to the perforation. Depending on scales of injection, our calculations show that the corrosion rates in the tubing wall from the wellhead to bottomhole is on the order of 1 mm/y for carbon steel. For stainless steel, the rate obtained is 0.0057 mm/y. Results of this study provide insights on the material selection of $CO_2$ injection wells, design of injection operations, as well as leakage monitoring and risk assessment in wellbores.