

# Dynamics adsorption of the enhanced CH<sub>4</sub> recovery by CO<sub>2</sub> injection

Min Gu<sup>1</sup>, Shuo Duan<sup>1</sup>, and Qirong Wu<sup>1</sup>

<sup>1</sup>Affiliation not available

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## Abstract

The dynamic adsorption isotherms of CO<sub>2</sub>-EGR were measured by using a Intelligent Gravimetric Analysis system. In the beginning stage of CO<sub>2</sub> injection, all the injected CO<sub>2</sub> enters into the adsorbent and the mole fraction of CH<sub>4</sub> ( $y_{CH_4}$ ) keeps 1.0. The CH<sub>4</sub> recovery factor (RCH<sub>4</sub>) increases. The duration of this stage (t<sub>cd</sub>) depends on the selectivity of CO<sub>2</sub> over CH<sub>4</sub> ( $SCO_2/CH_4$ ). A adsorbent with large  $SCO_2/CH_4$  has long t<sub>cd</sub>. When  $SCO_2/CH_4$  is greater than 1.0, CO<sub>2</sub> reduces the fraction of CH<sub>4</sub> in the adsorbed phase ( $x_{CH_4}$ ) and more CH<sub>4</sub> is driven out. In the second stage, the injected CO<sub>2</sub> competes with CH<sub>4</sub> for adsorption. The cumulative RCH<sub>4</sub> of this stage is much larger than that of the initial stage. However,  $y_{CH_4}$  decrease sharply.  $p_{CH_4}$  in the whole CO<sub>2</sub> injection is always larger than that before CO<sub>2</sub> injection, suggesting CH<sub>4</sub> desorption results from the displacement by CO<sub>2</sub> rather than from pressure depletion.

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