

**Effects of SO₂ and NO impurities on CO₂
hydrate-containing phase equilibria**

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In this work, effects of SO₂ and NO as impurities on CO₂ hydrate-forming conditions were experimentally determined in (aqueous liquid-hydrate-vapor) three-phase and (aqueous liquid-hydrate-vapor-guest-rich liquid) four-phase regions. Isobaric dissolution temperatures of formed hydrate were measured at temperature from 277 to 285 K and pressures from 2.0 to 4.5 MPa with mixed gases of SO₂ or NO and CO₂. The addition of SO₂ to CO₂ shifted incipient hydrate-forming conditions to lower temperatures. In three-phase region, the effect of the amount of water relative to mixed gas was studied to examine the effect of the overall composition on the hydrate-forming condition. As the relative amount of water increased at the same ratio of SO₂ to CO₂, the measured isobaric dissolution temperature decreased, indicating a decreased effect of SO₂ on CO₂ hydrate. Four-phase equilibrium data of CO₂, SO₂ and water mixtures showed a retrograde behavior on pT plane from the quadruple point of CO₂ and water mixture to that of SO₂ and water mixture. As NO contents in feed increased, the measured isobaric dissolution temperatures were found to decrease. However, the effect of NO was small when compared with that of SO₂.