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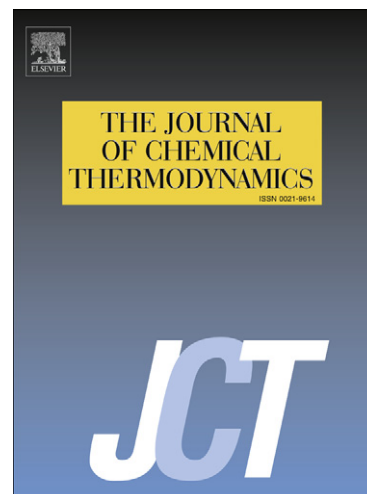
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## Hydrate phase equilibrium of ternary gas mixtures containing carbon dioxide, hydrogen and propane

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### Abstract:

Hydrate phase equilibrium of the ternary guest mixtures containing carbon dioxide, hydrogen and propane at two different compositions were determined. Addition of mole composition of 2.5 % propane to the fuel gas (CO<sub>2</sub> (40 %)/H<sub>2</sub> (60 %)) mixture reduces the hydrate formation conditions by 66 % at the temperature of 278.4 K. A Clausius-Clapeyron plot for the experimental results was plotted and from the slope, the enthalpy of hydrate dissociation was calculated. The enthalpy of dissociation of the mixed hydrate formed from a ternary gas mixture containing mole composition 38.1 % CO<sub>2</sub>, 59.4 % H<sub>2</sub> and 2.5 % C<sub>3</sub>H<sub>8</sub> was found to be 110 kJ·mol<sup>-1</sup> and hence it was concluded that the mixed hydrate formed structure II (sII) hydrates. Whereas for the ternary gas mixture containing mole composition 80.0 % CO<sub>2</sub>, 18.8 % H<sub>2</sub>, and 1.2 % C<sub>3</sub>H<sub>8</sub>, the enthalpy of dissociation of the mixed hydrate was found to be 78 kJ·mol<sup>-1</sup> and hence we believe the mixed hydrate formed the structure I (sI) hydrate.

**Keywords:** gas hydrates; thermodynamics; pre-combustion; carbon dioxide capture; global warming, phase equilibrium

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