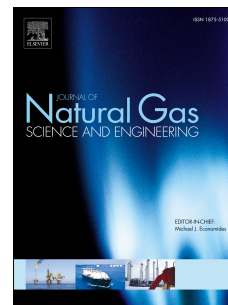


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## Effect of the amino acid L-histidine on methane hydrate growth kinetics

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### ABSTRACT:

In the present study, the effect of a polar amino acid, L-histidine on methane hydrate growth kinetics has been investigated. Methane hydrate formation experiments were carried out in a stirred tank reactor setup at pressure and temperature conditions of 274.15 K and 5.0 MPa respectively. Two different concentrations (0.1 and 1 wt %) of L-histidine were studied. Hydrate growth through molecular dynamic (MD) simulation was also studied; pressure and temperature conditions for the simulations were set at 10.0 MPa and 270.0 K, while the concentration of L-histidine was kept fixed at 0.94 wt %. Hydrate formation runs using MD simulation were carried out with optimal concentration of methane in water. The presence of L-histidine in the system was found to significantly enhance methane hydrate growth kinetics as compared to pure water for both experimental and MD simulation runs. Final gas consumption with 1 wt % L-histidine was found to be comparable to that with 1 wt % SDS, the most commonly used additive for hydrate promotion studies. L-histidine is a benign additive which offers considerable enhancement in methane hydrate formation kinetics and can be utilized for various hydrate based technologies such as methane storage and transport.

**Keywords:** *Gas hydrate; Amino acid; Kinetics; Molecular dynamic simulation; Crystal growth*

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