

Methanol—inhibitor or promoter of the formation of gas hydrates from deuterated ice?

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ABSTRACT

Kinetic studies are reported of the effect of methanol on the rate of formation of CO₂- and CH₄-hydrates by means of in situ time-of-flight neutron powder diffraction. The experiments were carried out at temperatures ranging from 200 to 250 K and pressures up to 7 MPa. The samples were prepared from mixtures of ground, deuterated ice and deuterated methanol (up to 20 vol%), which were transformed in situ into CO₂- or CH₄-hydrates by pressurizing the systems with the corresponding gas. The observed rates of formation of hydrates are orders of magnitude higher than the rate of formation from pure deuterated ice under the same pressure and temperature conditions. Glycols and alcohols, methanol in particular, are long known as thermodynamic inhibitors of hydrate formation. Our study indicates that methanol can also act as a kinetic promoter for the formation of gas hydrates. Preliminary data suggest that the kinetics also depend strongly on concentration and the isotopic composition.