

Supporting Information for

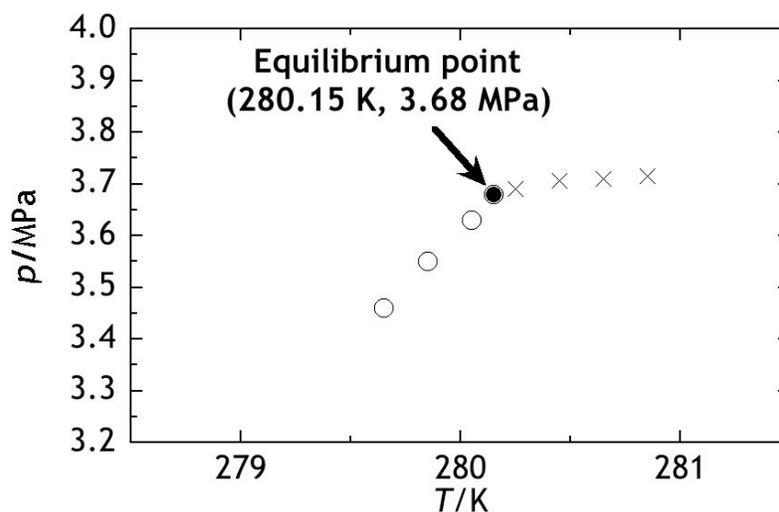
Structure-H (sH) Clathrate Hydrate with New Large Molecule Guest
Substances

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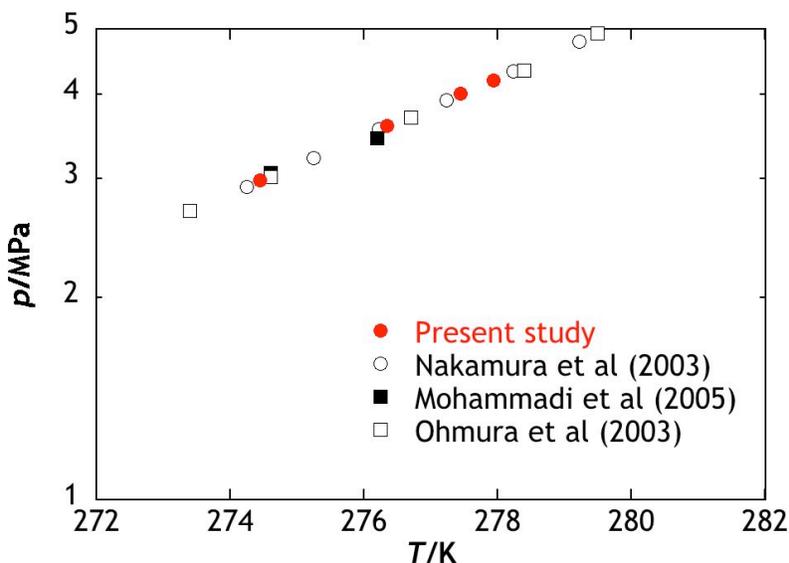


Supporting Figure S1. Scheme of determining equilibrium pressure–temperature point in a CH₄–BrCP–water system. ●, Equilibrium point (280.15 K, 3.68 MPa).

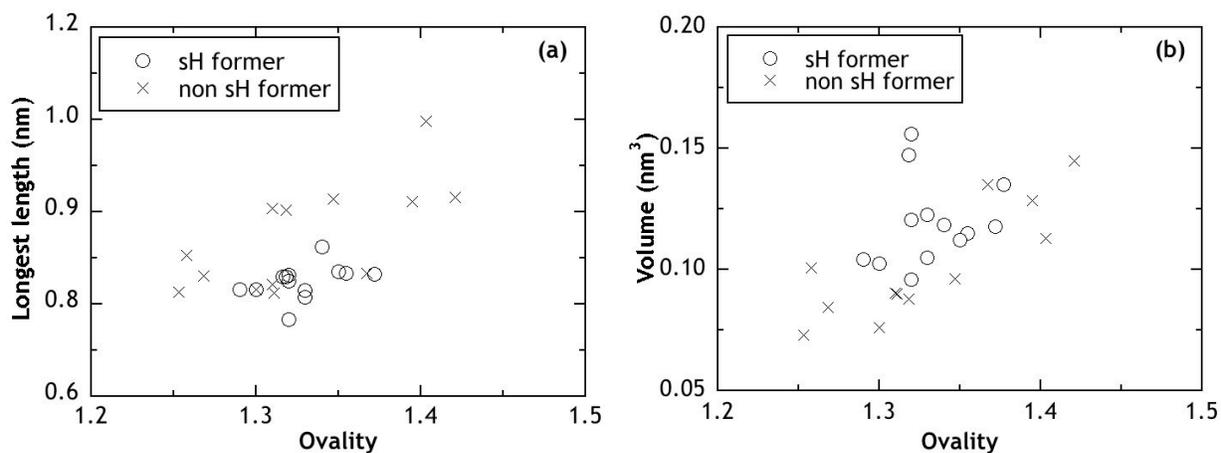
Supporting Table S1. Equilibrium pressure–temperature conditions for methane clathrate hydrates in our experimental setup.

| T^a/K | p^b/MPa |
|----------------|------------------|
| 274.5 | 2.98 |
| 276.4 | 3.59 |
| 277.5 | 4.01 |
| 277.9 | 4.20 |

^a: Uncertainty of dissociation temperature was estimated to be ± 0.1 K with a confidence level of approximately 95 %. ^b: Uncertainties of pressure measurements were estimated to be ± 0.05 MPa with a confidence level of approximately 95 %.



Supporting Figure S2. Equilibrium pressure–temperature conditions of methane clathrate hydrates. ●, present study; ○, Nakamura *et al.*;¹ ■, Mohammadi *et al.*;² □, Ohmura *et al.*;³



Supporting Figure S3. Relationships between geometric properties of large guest with/without sH hydrate formation. sH former: MCH, MCP, NH, isopentane, cycloheptane, adamantane, cis-1,2-dimethyl hexane, pinacolone, cycloheptanone, pinacol alcohol, tetramethylsilane, TBME, BrCP, BrCH. non sH former: toluene, n-hexane, n-pentane, isoprane, trans-1,2-dimethylhexane, 2,4-dimethylpentane, 3-methyl-1-butene, 2-methyl-2-butene, 2-methyl-1-butene, trans-2-butene, diethyl ether, 2,2,4-trimethylpentane, methyl acetate.

Reference.

- 1) Nakamura, T.; Makino, T.; Saguaro, T.; Ohgaki, K. Stability boundaries of gas hydrates helped by methane—structure-H hydrates of methylcyclohexane and cis-1,2-dimethylcyclohexane. *Chem. Eng. Sci.* **2003**, 58, 269–273.
- 2) Mohammadi, A. H.; Anderson, R.; Tohidi, B. Carbon Monoxide Clathrate Hydrates: Equilibrium Data and Thermodynamic Modeling. *AIChE J.* **2005**, 51, 2825–2833.
- 3) Ohmura, R.; Uchida, T.; Takeya, S.; Nagao, J.; Managua, H.; Ebinuma, T.; Narita, H. Clathrate hydrate formation in (methane + water + methylcyclohexanone) systems: the first phase equilibrium data. *J. Chem. Thermodyn.* **2003**, 35, 2045–2054.