

Supplementary Information

# Enhanced Methane Gas Storage in the form of Hydrates: Role of the Confined Water Molecules in Silica Powders

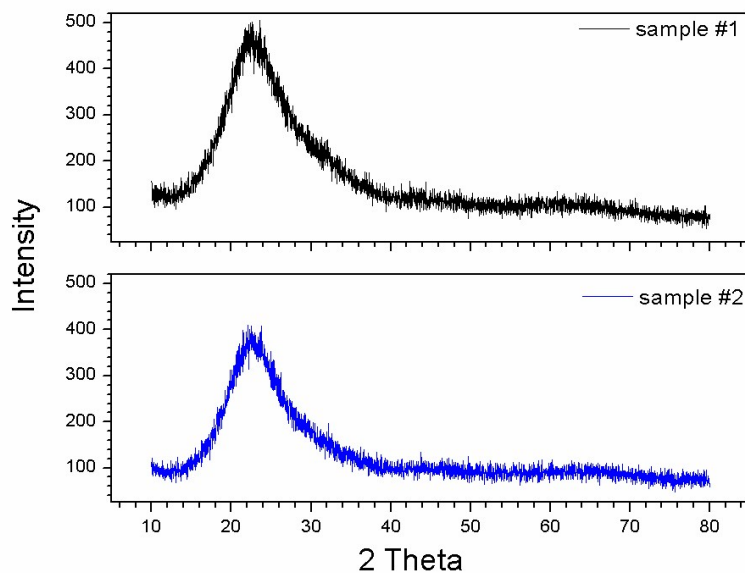
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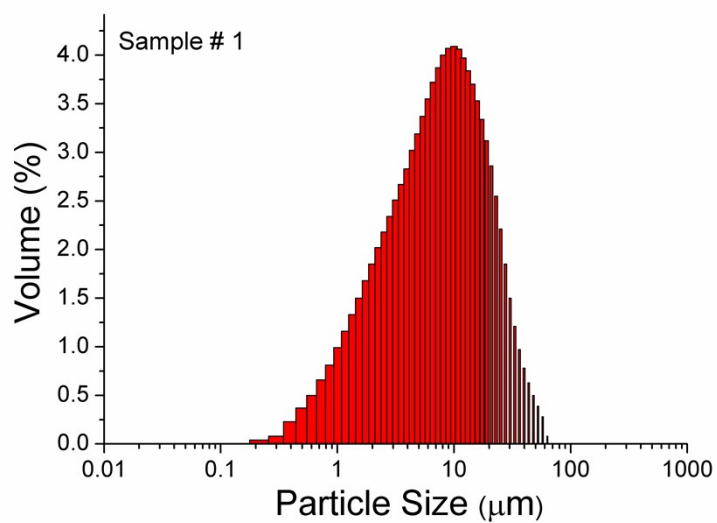
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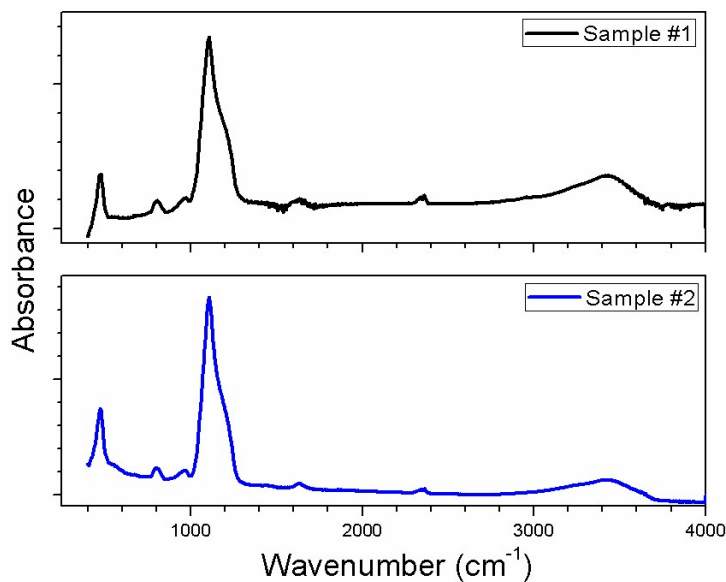
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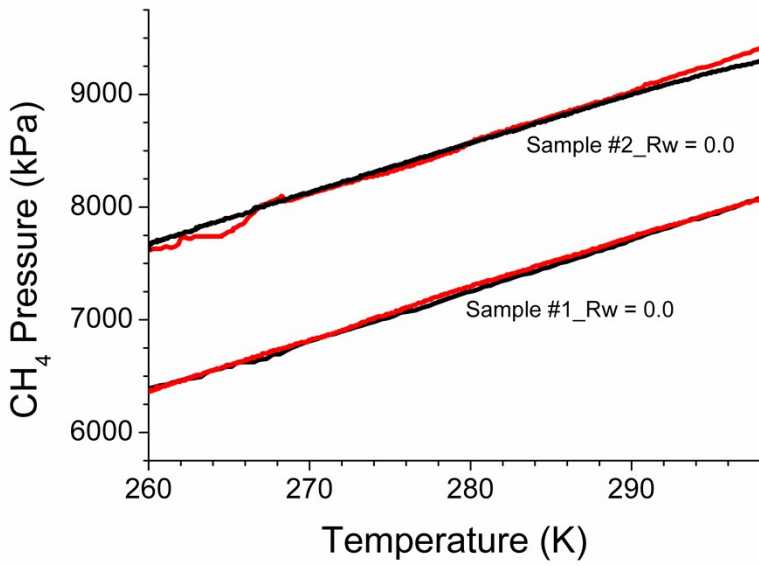
**SI-Figure 1:** Measured powder x-ray diffraction pattern of SiO<sub>2</sub> samples used in the present study.



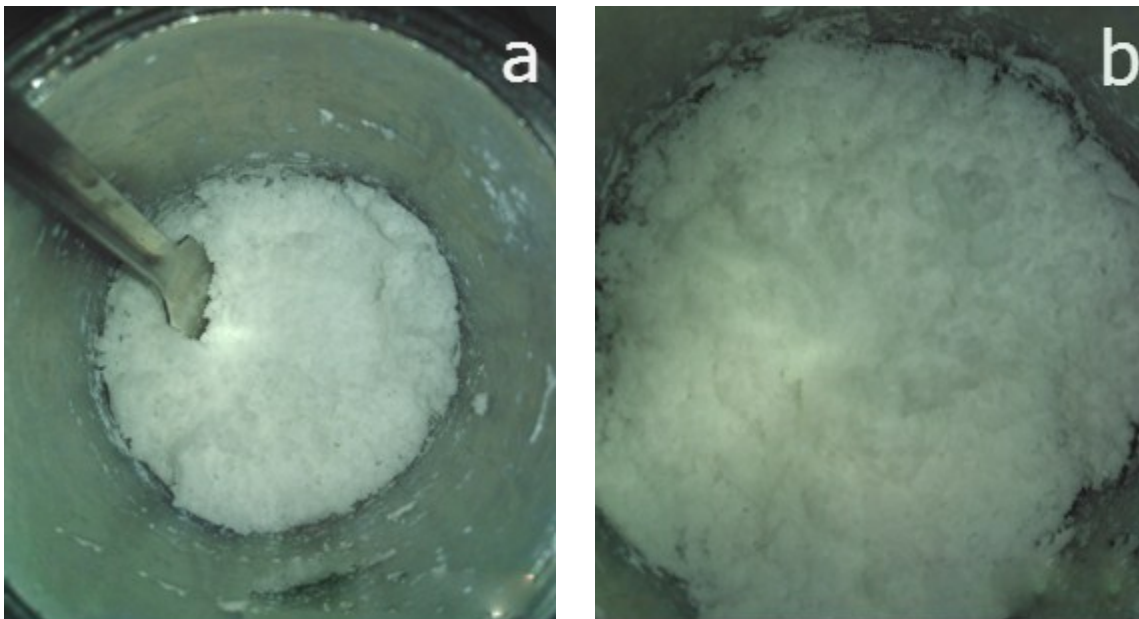
**SI-Figure 2:** The particle size distribution for sample #1 silica. The particle size distribution was measured by dynamic light scattering technique on Mastersizer 2000 instrument.

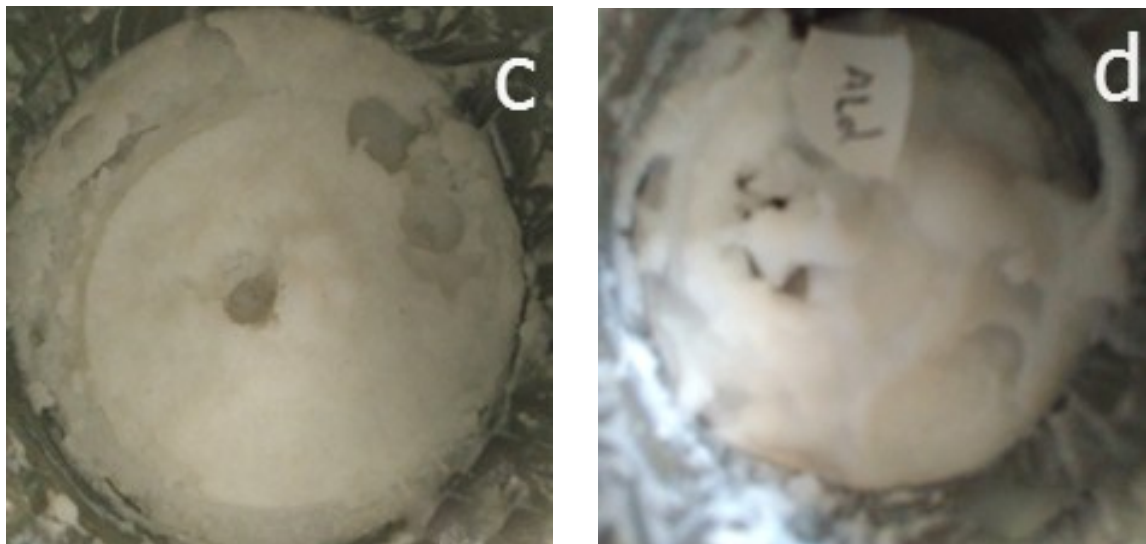


**SI-Figure 3:** FTIR spectrum (measured by KBr pellet method) of SiO<sub>2</sub> samples used in the present study.



**SI-Figure 4:** The pressure and temperature (p-T) trajectory of dry SiO<sub>2</sub> samples. Black and red curves are the observed behavior during freezing and thawing cycles respectively.





**SI-Figure 5:** Photographs of SiO<sub>2</sub> + H<sub>2</sub>O system. (a) Sample #1,  $R_w = 2.0$ ; (b) Sample #2,  $R_w = 2.0$ ; (c) Sample #1,  $R_w = 2.5$ ; (d) Sample #2,  $R_w = 2.2$ .