Supplementary Materials to

"Hydrate phase equilibrium of CH_4+N_2+CO_2 gas mixtures and cage occupancy behaviors"

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Figure captions

Figure S1. The mole ratio of CH_4 in large cages and small cages ($3x/\theta$) (calculated by CSMHYD program).

Figure S2. Relationship of values of θ/x of N_2 and CO_2 molecules with temperature.

Figure S3. Occupancy ratios of N_2 and CO_2 in hydrate cages (calculated by CSMHYD program).

Figure S4. Mole ratios of N_2/CO_2 in small and large cages(calculated by CSMHYD program).

Figure S5. Relative occupancies of $CH_4/N_2/CO_2$ in small cages (a), large cages (b) and hydrate cages(c) (calculated by CSMHYD program).

Figure S6. Variation of occupancy of CO_2 in large cages with the concentration of CH_4 in gas phase.

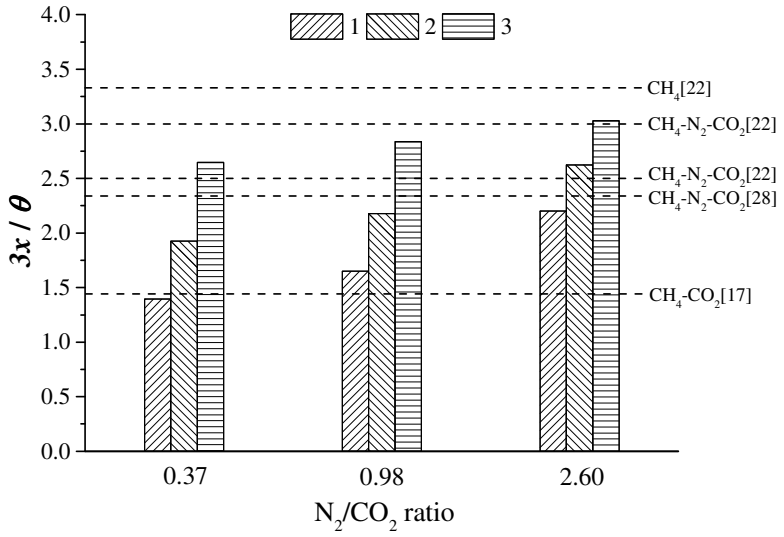


Figure S1. The mole ratio of CH_4 in large cages and small cages ($3x/\theta$) (calculated by CSMHYD program) The numbers of 1, 2 and 3 respectively represent the CH_4 levels of 20%, 50% and 80% in each group with different N_2/CO_2 ratios.

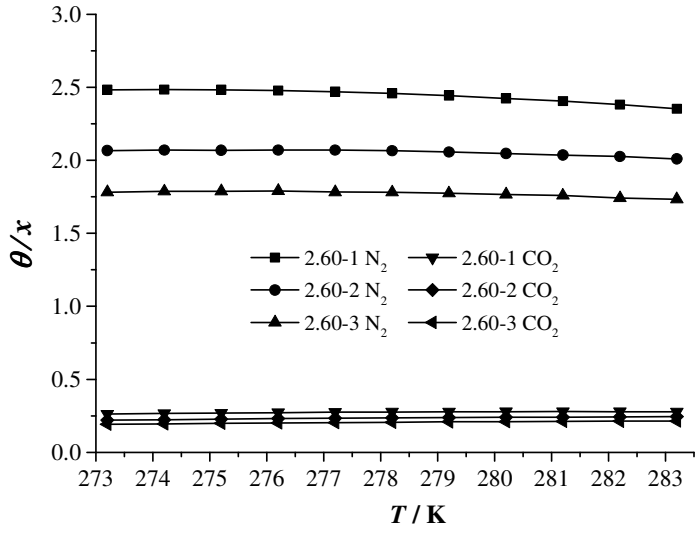


Figure S2. Relationship of values of θ/x of N_2 and CO_2 molecules with temperature. The numbers of 1, 2 and 3 respectively represent the CH_4 levels of 20%, 50% and 80% in each group with different N_2/CO_2 ratios.

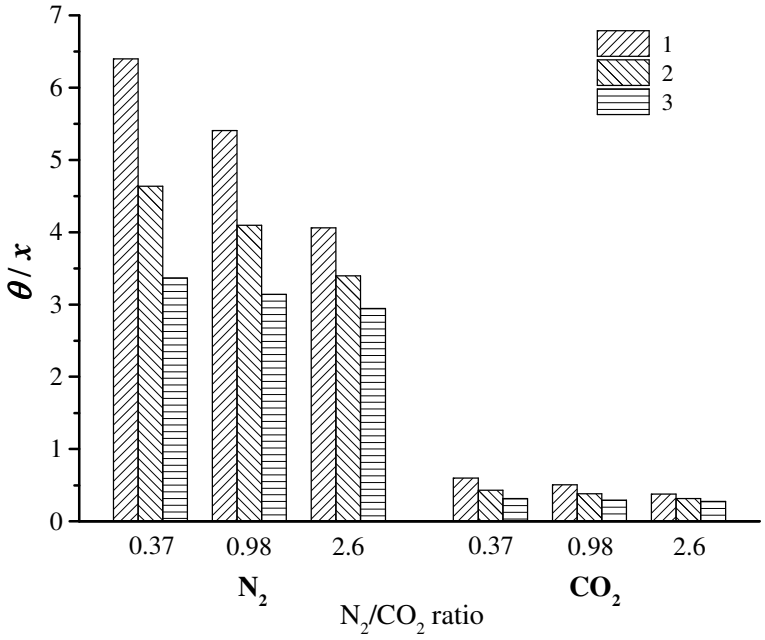
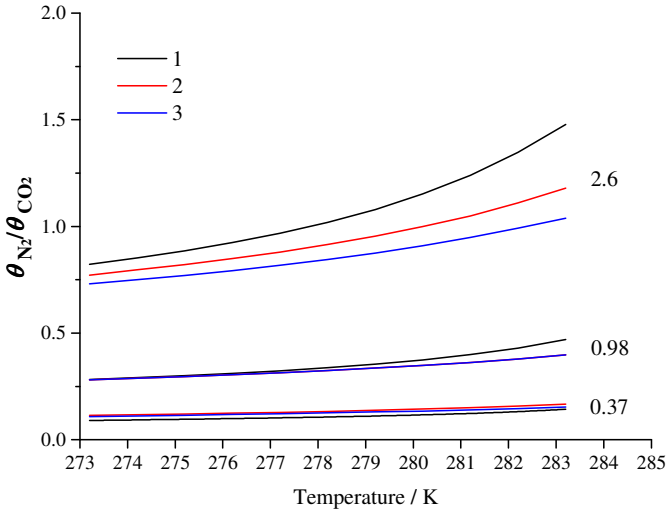
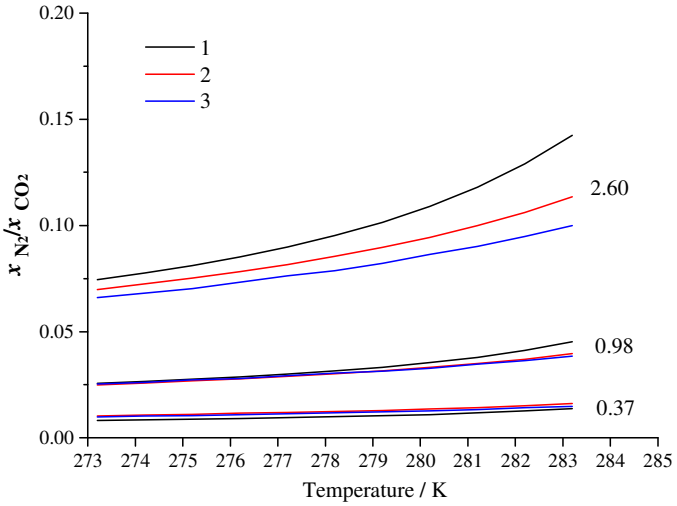


Figure S3. Occupancy ratios of N_2 and CO_2 in hydrate cages (calculated by CSMHYD program). The numbers of 1, 2 and 3 respectively represent the CH_4 levels of 20%, 50% and 80% in each group with different N_2/CO_2 ratios.

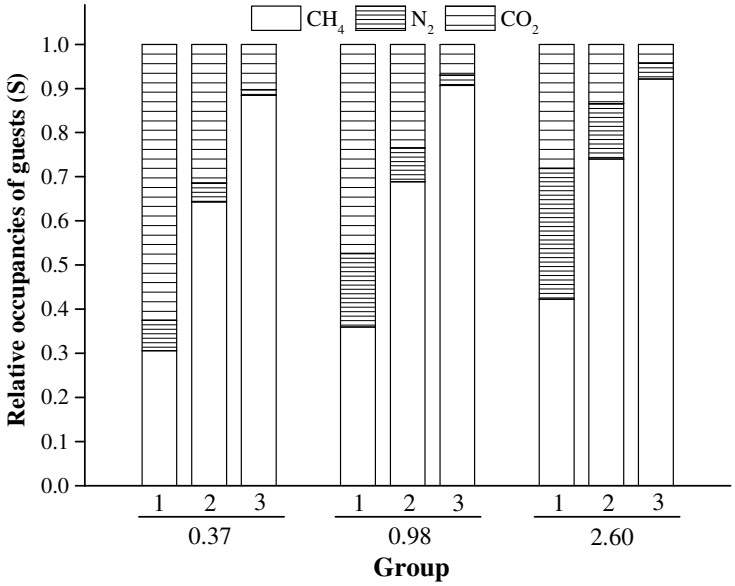


a. In small cage

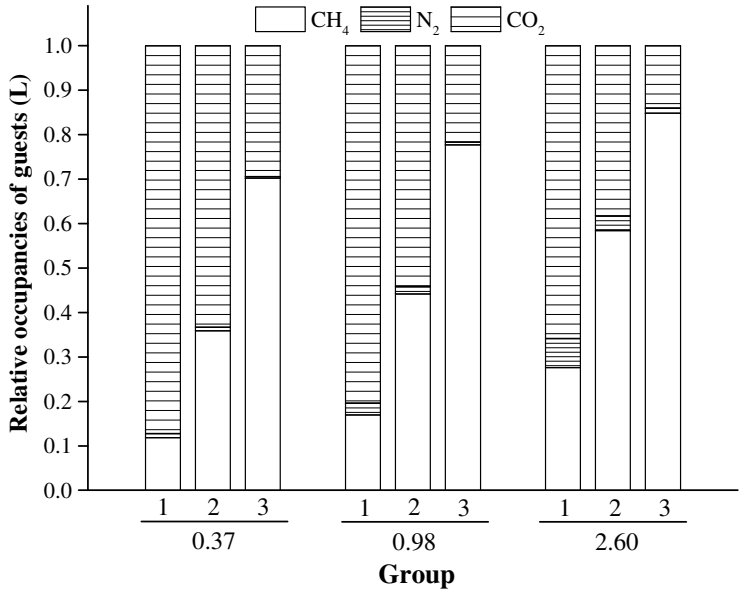


b. In large cage

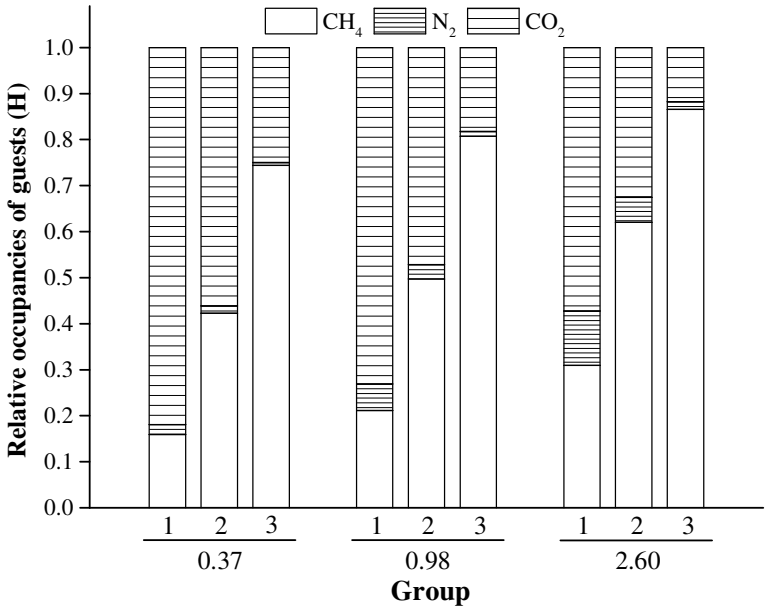
Figure S4. Mole ratios of N_2/CO_2 in small and large cages (calculated by CSMHYD program). The numbers of 1, 2 and 3 respectively represent the CH_4 levels of 20%, 50% and 80% in each group with different N_2/CO_2 ratios.



a. Small cage (S)



b. Large cage (L)



c. Hydrate cages (H)

Figure S5. Relative occupancies of $CH_4/N_2/CO_2$ in small cages (a), large cages (b) and hydrate cages (c) (calculated by CSMHYD program). The numbers of 1, 2 and 3 respectively represent the CH_4 levels of 20%, 50% and 80% in each group with different N_2/CO_2 ratios.

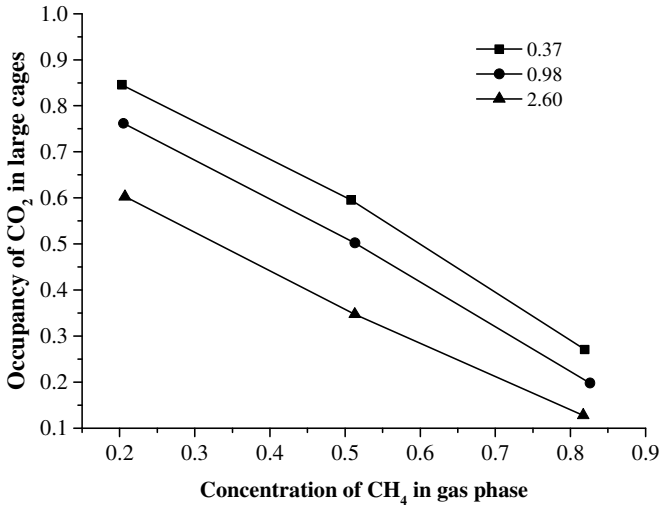


Figure S6. Variation of occupancy of CO_2 in large cages with the concentration of CH_4 in gas phase