

NMR and Cage Occupancy Analysis of Na-Montmorillonite + Methane Hydrate System

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Here we show the clear experimental results on promotion effects of methane hydrate formed in clay sediment layer (Na-Montmorillonite) through thermodynamic P/T condition and microscopic analysis through solid-state NMR spectrometry. We checked the ^{27}Al , ^{29}Si , and ^{23}Na NMR, and demonstrate that the interlayer cation possessed the important role of hydrate formation stability by providing ion nucleation site and present one of the possibilities of the guest molecule of interlayer cation as a stabilizing effect elucidated from abnormal distributions of methane molecule in clay layers. We also examined the cage occupancy ratio of large cage to small cage with increasing clay contents from 8wt% to 60wt%. The ratio of large to small was gradually increased from 4.0 to 8.0 with clay contents.