

Metastability of Ethane Hydrate Induced by Cobalt Complex and Base

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Gas hydrate is a kind of inclusion compounds, which is composed of host water framework and guest gas molecules. Ethane gas is known to make structure-I hydrate only without other guests such as THF or methane. In this study, we examined cobalt complex added ethane hydrate system using solid state NMR, dispersive Raman spectroscopy and neutron powder diffraction. Cobalt (III) hexamine complex with some small anions such as OH⁻ and F⁻ was found to induce ethane hydrate to structure-II in the early stage of hydrate formation and this unexpected metastable structure, obviously due to complex encagement, was preserved for remarkably long time comparing to other metastable hydrate phases. The present findings show a possibility for usage of complex ion as a new guest and might provide new insights on structure modification and metastability in clathrate hydrate fields.