Spectroscopic identification of gas hydrates in the presence of inhibitors

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Gas hydrates are supramolecular compounds in which gas molecules are enclathrated in the cavities composed of water molecules. Spectroscopic analysis of gas hydrates enables us to identify their crystallographic information. In the present work, we performed spectroscopic analyses using ^{13}C NMR, Raman spectroscopy, and Synchrotron powder X-ray diffraction for gas hydrates in the presence of 0.1 to 3.0 mol% amino acids in the temperature range of 80 to 200 K. It was found that there was no structure transition induced by amino acids. According to the lattice parameter values obtained from powder X-ray diffraction patterns, however, crystal lattice expansion of gas hydrates induced by amino acids was ocurred, and the extent of lattice expansion were found to depend upon the hydrophobicity of amino acids. This result will play a significant role in the thermodynamic modeling of gas hydrate in the presence of inhibitor systems.