CO_2 CAPTURE FROM BINARY GAS MIXTURE VIA CLATHRATE HYDRATES FORMATION: INVESTIGATION BY RAMAN SCATTERING

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ABSTRACT

The global greenhouse effect of CO_2 has attracted increased attention as a worldwide problem. CO_2 capture and sequestration (CCS) for industry is a great challenge that is susceptible to reduce carbon emission. Exhausting gases from industry contains CO_2, N_2, CH_4, O_2 in localized areas: steelmaking plants, gas or coal power plants, chemical plants, etc. In post combustion capture, CO_2 concentration is generally low; typically 5-10% for power plants, but it can be higher: up to 40% in steelmaking plants, or also in some cases of natural gas production. Different strategies and technologies of capture need to be developed to decrease the cost of the process, in respect to the specific compositions and operative conditions, especially pressure. Gas hydrates are currently getting a significant attention as a potential CO_2 storage technology.
The equilibrium properties of CO_2-N_2 gas hydrates are investigated by p-T and in-situ Raman spectroscopy. sI and sII structures are identified depending on the loading or equilibrium composition [1]. The equilibrium properties of CO_2-xTBAB-H_2O (with x = 40 wt%, 5 wt%) hydrates and N_2-xTBAB-H_2O (with x = 5wt%) are determined and the structure (type A or B) is found to depend on the equilibrium (or loading) pressure of CO_2 or N_2. It is the first time that an inversion of the stable phase of tetra-n-butyl ammonium bromide (TBAB) is observed when a gas (CO_2 or N_2) is trapped in the water cages [2].

[1] B. Chazallon, **CO_2 capture by gas hydrate crystallization: investigation of equilibrium and compositional properties by micro-Raman spectroscopy,** *in* **Physics and Chemistry of Ice,** Y. Furukawa, G. Sazaki, T. Uchida, N. Watanabe Eds, Hokkaido University Press, , ISBN 978-4-8329-0361-6, pp 173-181 (2011)

[2] B. Chazallon, **Binary CO_2-N_2 clathrate hydrates of TBAB investigated by Raman scattering**, J. Phys.Chem.C, in prep.