Phase Equilibria and Dissociation Enthalpies of Tri-n-butylphosphine Oxide Semiclathrate Hydrates Incorporated with CH_4, CO_2, and H_2

이기선, 차종호[1], 강정원, 김기섭*
한국교통대학교; [1]한국에너지기술연구원
(kks1114@ut.ac.kr*)

We investigated the phase equilibrium boundary of tri-n-butylphosphine oxide (TBPO) semiclathrate hydrates incorporated with CH_4, CO_2, and H_2. TBPO aqueous solutions with a molality (m) of (1.61 and 1.98) mol•kg^{-1} were used for hydrate formation, which corresponded to the clathrate structures of TBPO• 34.5H_2O and 28H_2O, respectively. The phase boundary at both concentrations was shifted to the promotion region represented by lower pressures and higher temperatures, compared to each simple gas hydrate. In particular, TBPO + CO_2 double hydrate presented mild hydrate stabilization conditions less than 1 MPa at (280 to 285) K. Additionally, the dissociation enthalpy (ΔHd) calculated from the phase boundary curves for the TBPO + CO_2 double hydrates was almost the same as that for tetra-n-butylammonium bromide (TBAB) + CO_2 double hydrate (219.5 kJ•mol^{-1} for m = 1.61 mol•kg^{-1} and 211.6 kJ•mol^{-1} for m = 1.98 mol•kg^{-1}). These results demonstrate that the TBPO + CO_2 double hydrate could be used as refrigerants for cold storage and transportation.