Supporting Information

Dissociation kinetics of Propane-Methane and Butane-Methane hydrates below the melting point of ice

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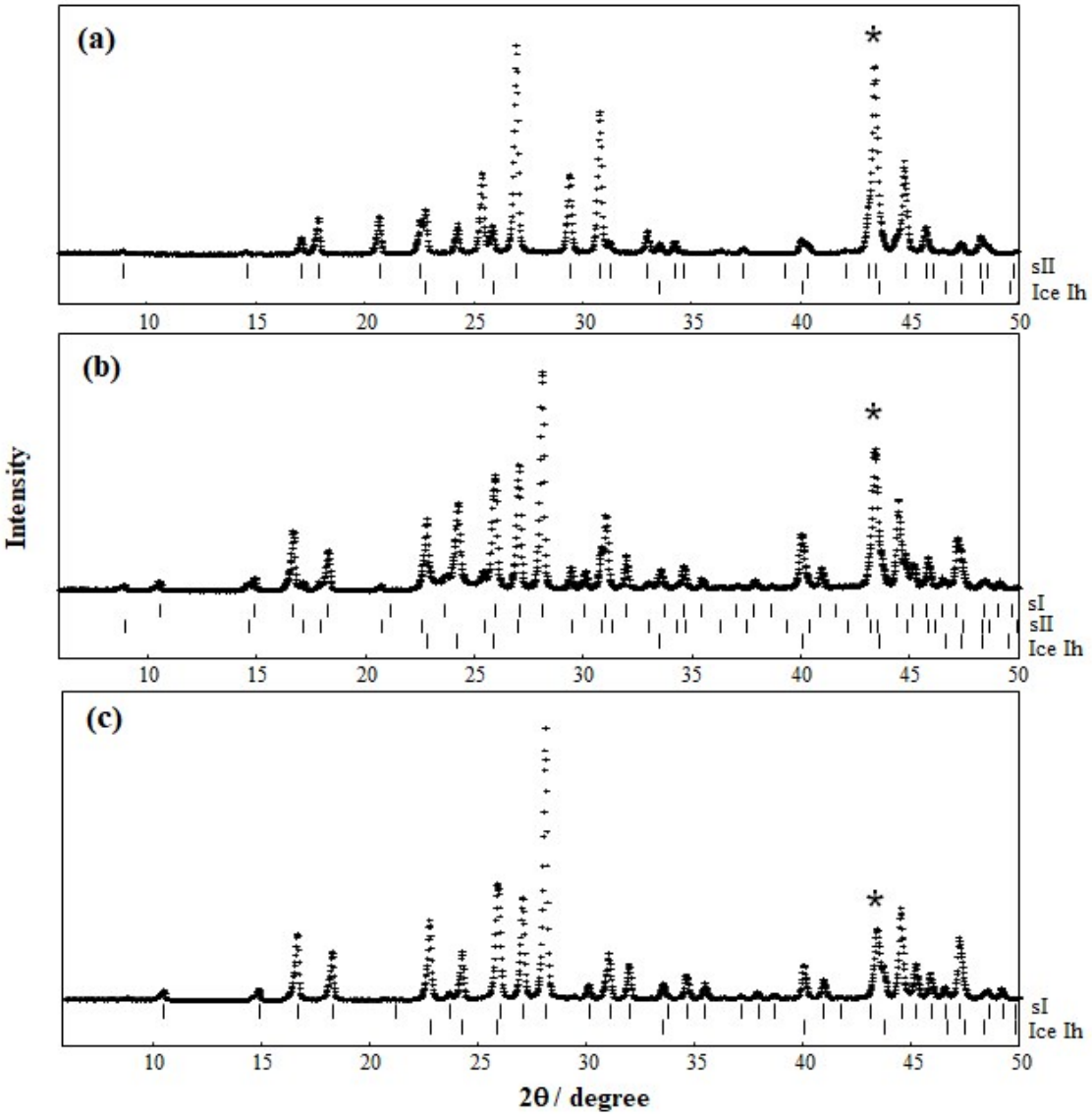

Figure S1 Powder X-ray diffraction patterns of the binary gas hydrate of $C_3H_8 + CH_4$ at 123 K. Here, the bottom dashes represent the calculated peak positions for the sI and sII hydrate and the hexagonal ice. (a) $C_3H_8 + CH_4$ hydrate (C_3H_8/CH_4 = 0.393/0.607) of sII, (b) $C_3H_8 + CH_4$ hydrate (C_3H_8/CH_4 = 0.028/0.972) of sI and sII, and (c) $C_3H_8 + CH_4$ hydrate (C_3H_8/CH_4 = 0.002/0.998) of sI. The asterisk (*) represents the diffraction peak of the Cu sample holder.

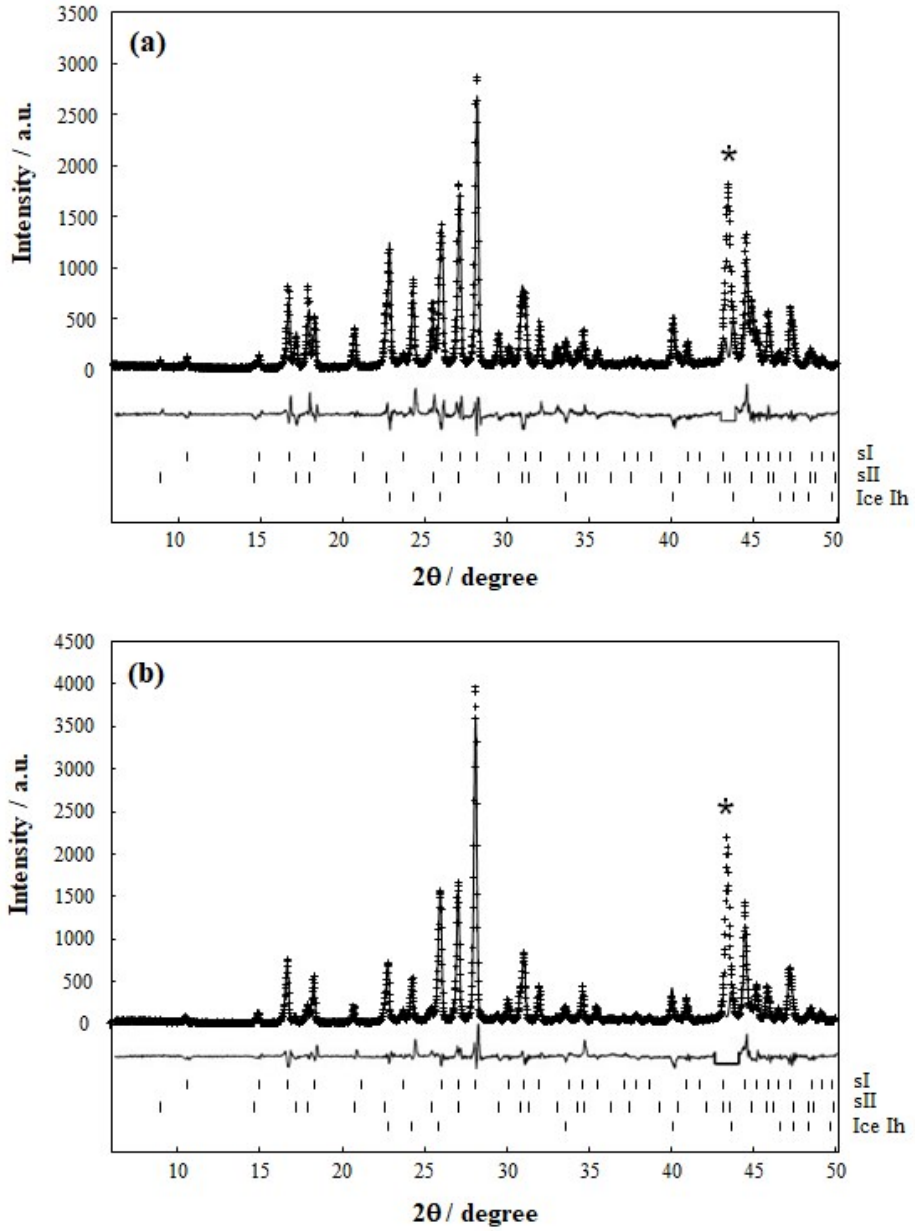

Figure S2 PXRD pattern of mixture of sI pure CH_4 hydrate, sII pure C_3H_8 hydrate, and ice Ih at 123 K. The plus signs (+) denote the observed intensities; the black solid line was calculated from the crystal structure model. The bottom curve shows the deviation between the observed and calculated intensities, where blank regions are excluded from the analysis because of the presence of Bragg reflections (*) from the Cu sample holder. The bottom dashes represent the calculated peak positions for sI hydrate, sII hydrate, and hexagonal ice Ih. Volume ratio of the mixtures analyzed by the Rietveld method are (a) sI/sII/Ih = 0.55/0.26/0.19 and (b) sI/sII/Ih = 0.80/0.09/0.11.