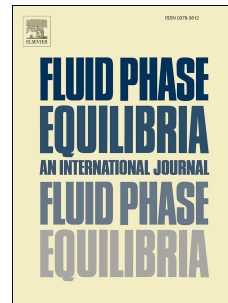


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Gas-containing semiclathrate hydrate formation by tetra-*n*-butylammonium carboxylates: acrylate and butyrate

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ABSTRACT

Semiclathrate hydrates are water-based host-guest materials that consist of water and ionic guest substances such as quaternary ammonium salts. Widely-used tetra-*n*-butylammonium (TBA) salts are designed for gas selectivity and capacity with respect to the industrial application of these materials. This study reported on the formation of semiclathrate hydrates of TBA carboxylates with guest gas characterized by phase equilibrium measurements and single crystal X-ray diffraction. Specifically, TBA acrylate and TBA butyrate are used for ionic guest substances, and this may induce a tetragonal $P4_2/mmm$ semiclathrate hydrate structure. In the four systems of (TBA acrylate or TBA butyrate) + (CH₄ or CO₂) + H₂O, the measured three (gas-hydrate-aqueous) phase equilibrium data exhibited better promotion effects due to the TBA acrylate and TBA butyrate when compared with that of the widely-used TBA bromide. The

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