Lattice Contraction Behavior Occurring in Ionic Clathrate Hydrate

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Clathrate hydrates are the types of inclusion compounds which are stabilized by physical interaction, such as van der Waals, between host-guest systems without direct guest-guest interaction. Lattice constant of gas hydrate is a characteristic value for determining physico-chemical variables of hydrate structure. Here, we firstly described the lattice contraction behavior occurring in γ-irradiated $Me_4NOH + O_2$ hydrate due to the stable entrapment of the superoxide ions in γ-irradiated Me4NOH + O_2 hydrate. Owing to peculiar direct guest-guest ionic interaction, the lattice structure of γ-irradiated $Me_4NOH + O_2$ hydrate shows significant change of lattice contraction behavior even at relatively high temperature (120 K). Such findings are expected to provide useful information for a better understanding of unrevealed nature of clathrate hydrate fields.