

Physicochemical properties of ionic hydrate inclusion compounds

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Ionic clathrate hydrates consist of ionic guest and water-counterion host framework to form their unique crystal structure. Some of the ionic hydrate inclusion compounds are considered as superionic conductors due to their high proton conductivity even at low temperature, and thus they have been in interest as new types of solid electrolytes. In practice, tetramethylammonium hydroxide pentahydrate with high melting temperature (68°C) can be utilized as a solid electrolyte for electrochemical hydrogen gas sensor. The proton conduction through the host network is profoundly affected by the crystal structure and identity of anions. The existence of ions in the clathrate generates ionic interaction between host and guest species, which make it possible to exhibit unique thermal behavior depending on the temperature. In this study, ionic conductivities of the several peralkylammonium salt hydrates are compared and the difference in conductivity is taken into account. Additionally, thermal properties of some ionic clathrate hydrates selected are measured for better understanding of host-guest chemistry.