

**Ionic clathrate hydrates as novel proton conductors**

이원희, 박성민, 이 혼\*

KAIST

(h\_lee@kaist.ac.kr\*)

The clathrate hydrate, which is one of the inclusion compounds, is composed of water host and small gases or organic guests, such as  $\text{CH}_4$ ,  $\text{CO}_2$ ,  $\text{C}_3\text{H}_7\text{OH}$ . However, some ionic materials are able to be incorporated into the water framework, creating water-ion host network, and play roles of ionic guests. Tetraalkylammonium hydroxides(TAAHs) are the representative clathrate hydrate-forming species. Because TAAHs-based ionic clathrate hydrates are stabilized by ionic interaction between the ionic host and guest, they exhibit relatively higher thermal stability than normal gas hydrates. Furthermore, high ionic conduction is shown in the several ionic clathrate hydrates due to the incorporation of the ionic species into the water host. In particular,  $\text{Me}_4\text{NOH}\cdot 5\text{H}_2\text{O}$  possess high melting point and ionic conductivity, which make it possible to use the material as a proton conductor for the hydrogen electrochemical sensor. The novel sensor assembly shows high hydrogen sensing performance and it is predicted that the performance will be better by reducing the electrolyte thickness.