

The ionic clathrate hydrate as a solid electrolyte for a supercapacitor

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Tetraalkylammonium hydroxide hydrates, which are the representative ionic clathrate hydrates, are classified as superionic conductor due to their high proton conductivity even at subzero temperature. They are composed of various types of alkylammonium guests and water-hydroxyl host framework that plays a role in proton-conducting channel. The ionic clathrate hydrates have been investigated as solid electrolytes for practical electrochemical systems, such as battery and hydrogen gas sensor. In this study, tetramethylammonium hydroxide pentahydrate ($\text{Me}_4\text{NOH}\cdot 5\text{H}_2\text{O}$), which is known to show the highest thermal stability ($\text{mp}=68^\circ\text{C}$), was studied as a solid electrolyte for all-solid-state supercapacitor. The capacitor system showed higher capacitance than those of conventional capacitors and the capacitance was profoundly affected by carbon electrode material types.