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Communication

Temperature stability of symmetric activated carbon supercapacitors assembled with *in situ* electrodeposited poly(vinyl alcohol) potassium borate hydrogel electrolyte

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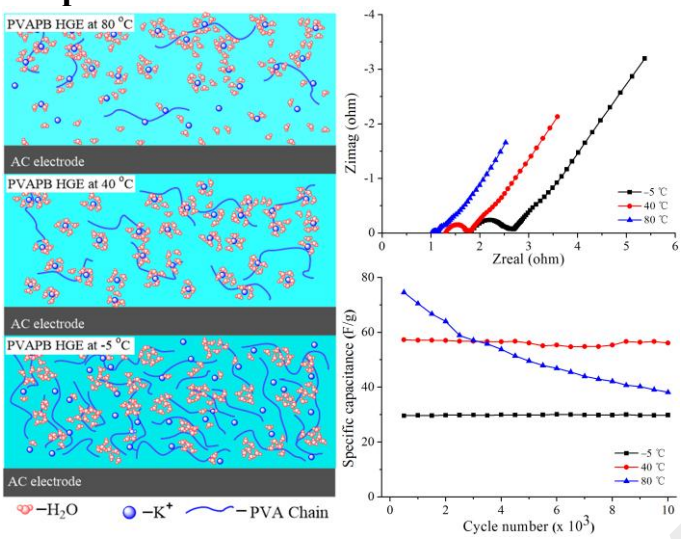
Graphical Abstract



Temperature stability of symmetric activated carbon (AC) supercapacitors (SCs) assembled with *in situ* electrodeposited poly(vinyl alcohol) potassium borate hydrogel electrolyte was systematically studied and compared with that of AC SCs assembled with liquid aqueous electrolytes in the temperature range from −5 ºC to 80 ºC.

ABSTRACT

The temperature stability of supercapacitor (SC) is largely determined by the properties of the electrolyte. Hydrogel electrolytes (HGE), due to their hydrophilic polymer skeleton, show different temperature stability to that of liquid aqueous electrolytes. In this study, symmetric activated carbon (AC) SCs had been assembled with *in situ* electrodeposited poly(vinyl alcohol) potassium borate (PVAPB) HGE. The electrochemical performance of the SCs was systematically studied at different temperatures. Results show that the conductivity of PVAPB HGE is comparable with that of liquid aqueous electrolytes at different temperatures. The operating temperature range of PVAPB HGE SCs is −5 ºC to 60 ºC, while those of the 1 mol/L Na_2SO_4 SCs and the 0.9 mol/L KCl SCs are 20 ºC to 80 ºC and 20 ºC to 40 ºC, respectively. The specific capacitance of PVAPB HGE SC is higher than those of SCs using liquid aqueous electrolytes at any temperature. The excellent temperature stability of PVAPB HGE makes it possible to build stable aqueous SCs in the wider temperature range.

Keywords
Hydrogel
Electrolyte
Electrodeposition
Temperature stability
Supercapacitor