

Ordered mesoporous carbon CMK-8 cathodes for high-power and long-cycle life sodium hybrid capacitors

Phan Tuan Ngoc, 공민경, Ranjith Thangavel, 이윤성, 고창현[†]
Chonnam National University
(chko@jnu.ac.kr[†])

Electrochemical energy storage devices with simultaneous high energy and high power output are critical in next-generation smart applications. Sodium hybrid capacitors (NHCs) are relatively new devices integrating the functions of batteries and capacitors. Research on capacitor-type carbon electrodes in NHCs is necessary to improve the energy-power behavior. Herein, we study ordered mesoporous carbon (OMC) materials synthesized at different temperatures (600 °C, 750 °C, and 900 °C) utilizing the KIT-6 silica template applied as adsorption cathodes for NHCs, paired with the superionic conductor $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ as the anode material. Raman measurement indicates that the degree of graphitization is maximized at 750 °C. As a result, the OMC carbonized at 750 °C delivered the best performance among three OMCs, with a high energy density (54 Wh kg^{-1}), high power (2200 W kg^{-1}) and superior stability (5000 cycles). The current research demonstrates a new platform for utilizing OMCs as adsorption electrodes in NHCs to realize a high-energy, high-power, and highly stable storage devices.