Highly stable commercial-level mass-loaded supercapacitor using *Datura stramonium* seeds derived activated microporous biocarbon

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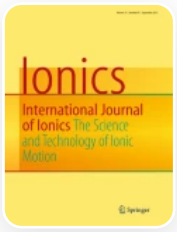

Ionics

Aims and scope

Submit manuscript

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Abstract

The exploration of biocarbon using various bio-resources has received great importance as the awareness of environmentally benign energy storage technologies is increasing drastically. Additionally, the active mass

loading of the electrode in the supercapacitors has recently gained great importance as it meets the industrial requirement as well as provides practical electrochemical performance. In this study, we synthesized activated biocarbon using *Datura stramonium* seeds through pyrolysis with chemical activation. To achieve real-world performance, biocarbon mass loadings at commercial levels ($\geq$10 mg cm^{-2}) were used in the fabrication of symmetrical supercapacitors. The single electrode-specific capacitance of 114 F g^{-1} was estimated at 1.2 V with excellent coulombic efficiency of 99% and energy efficiency of 82%. We obtained the maximum specific energy of 5.6 Wh kg^{-1} at 0.1 A g^{-1} and specific power of 980 Wkg^{-1}. Excellent specific capacitance retention of 100% is noted at the end of 10,000 GCPL cycles at 1.0 A g^{-1}, indicating that symmetrical supercapacitors with synthesized biocarbon possess high stability.