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Electrodepositing manganese oxide into a graphene hydrogel to fabricate an asymmetric supercapacitor

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Abstract

Asymmetric supercapacitors possess advantages of elevated capacitance, extended output voltage, and then improved power-energy characteristic. Here we report on a composite electrode prepared by electrodepositing manganese oxide into a graphene hydrogel and its capacitive performance in an asymmetric supercapacitor. The manganese oxide/graphene hydrogel exhibits a specific capacitance of 352.9 F g^{-1} at 1 A g^{-1} . The aqueous asymmetric supercapacitor composed of an active carbon as a negative electrode and the manganese oxide/graphene hydrogel as a positive electrode possesses good cycle stability (91.5% of capacitance retention after 5000 cycles) and is able to deliver an energy density of 41.8 Wh kg^{-1} at a power density of 0.2 kW kg^{-1} . Its possibility to serve as a power supply for a practical application was verified by lighting up a blue light-emitting diode. These results demonstrate the electrodeposition process has promising prospect in the preparation of high-performance composite electrodes for advanced electrochemical energy storage devices.

Key words: Graphene hydrogel; Manganese oxide; Electrodeposition; Asymmetric supercapacitor

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