Electrochemical Performance Studies of MnO_2 Nanoflowers Recovered From Spent Battery

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ABSTRACT

The electrochemical performance of MnO_2 nanoflowers recovered from spent household zinc–carbon battery is studied by cyclic voltammetry, galvanostatic charge/discharge cycling and electrochemical impedance spectroscopy. MnO_2 nanoflowers are recovered from spent zinc–carbon battery by combination of solution leaching and electrowinning techniques. In an effort to utilize recovered MnO_2 nanoflowers as energy storage supercapacitor, it is crucial to understand their structure and electrochemical performance. X-ray diffraction analysis confirms the recovery of MnO_2 in birnessite phase, while electron microscopy analysis shows the MnO_2 is recovered as 3D nanostructure with nanoflower morphology. The recovered MnO_2 nanoflowers exhibit high specific capacitance (294 F g^{-1} at 10 mV s^{-1}; 208.5 F g^{-1} at 0.1 A g^{-1}) in 1 M Na_2SO_4 electrolyte, with stable electrochemical cycling. Electrochemical data analysis reveal the great potential of MnO_2 nanoflowers recovered from spent zinc–carbon battery in the development of high performance energy storage supercapacitor system.

KEYWORDS: Electrochemical properties; Energy storage; Nanostructures; Oxides

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