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Enhanced specific energy of silver-doped MnO_2/graphene oxide electrodes as facile fabrication symmetric supercapacitor device

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Abstract

The present work is about the preparation of silver (Ag)-doped manganese oxide (MnO_2)/graphene oxide (GO) composite thin films are deposited by a facile and binder-free successive ionic layer adsorption and reaction (SILAR) method for the first time. The Brunauer-Emmett-Teller (BET) study revealed the nanosheets of MnO_2–Ag3/GO exhibit high specific surface area of 192 m^2g^{-1}. The tailored flower-like morphology and interconnected nanosheets of MnO_2–Ag3/GO electrodes achieved high electrochemical performance. The maximum specific capacitance (Cs) of 877 Fg^{-1} at the scan rate of 5 mVs^{-1} is obtained for MnO_2–Ag3/GO electrode tested in 1 M sodium sulfate (Na_2SO_4) electrolyte with capacity retention of 94.57% after 5000 cycling stability. The MnO_2–Ag3/GO composite-based flexible solid state symmetric supercapacitor (FSS-SSC) device delivered Cs as 164 Fg^{-1} with specific energy of 57 Wh kg^{-1} at specific power of 1.6 $kWkg^{-1}$ and capacitive retention of 94% after 10,000 cycles.

Graphical abstract

Figure showing the specific energy versus specific power and flexible solid state symmetric supercapacitor device of configuration MnO_2–Ag3/GO//PVA-Na_2SO_4//MnO_2–Ag3/GO electrodes.