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Facile hydrothermal synthesis of Dy-doped $NiMnO_3$ nanoflakes as a highly stable electrode for energy conversion system

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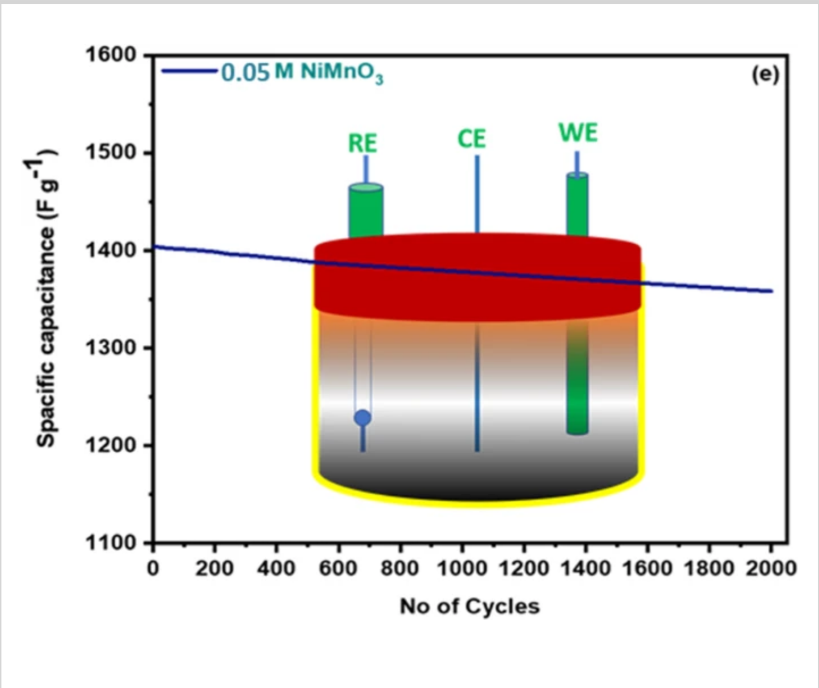
Abstract

Supercapacitors are a kind of energy storage devices and have recently gained a lot of researcher's interest. However, it is still difficult to create supercapacitors material based on mixed transition metal oxides with large specific capacitance, structural strength, and great energy efficiency at an attractive cost. The simple co-precipitation method was employed to make dysprosium-doped nickel manganese oxide with different concentrations for the energy conversion

system. The electrochemical performance of the Dy-doped $NiMnO_3$ on Copper foam (CF) as a conductive substrate was investigated under a 2.0 M KOH electrolyte. The experiments are conducted using cyclic voltammetry (CV) using various ranging scan rates from 5 to 40 mV s^{-1}, galvanostatic charge–discharge (GCD) at various current densities of 0.07, 0.05, and 0.1 Ag^{-1}, and (EIS) Electrochemical Impedance Spectroscopy at frequencies between 100 Hz and 100 kHz. The resultant specific capacitance and energy density of the 0.05 M Dy-doped NMO/CF electrode are 2006 F/g and 72.35 W/kg, separately. Consequently, large amounts of the Dy-doped $NiMnO_3$ have been suggested as a material for applications involving next-generation supercapacitors.



Highlights

- The Dy-doped $NiMnO_3$ with different concentrations has been prepared by co-precipitation process.

- The electrochemical result suggests that 0.05 M doped $NiMnO_3$ exhibited the specific capacitance 2006 F/g and energy density of 72.35 Wh/Kg @ 0.05 A/g.

- The long-term and cyclic stability results indicate that the electrode material display 96% retention capacitance after successive 2000 cycles.

- The electrochemical performance of perovskite material suggested that these can be used in energy storage applications.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Ethics declarations

Conflict of interest

The authors declare no competing interests.

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