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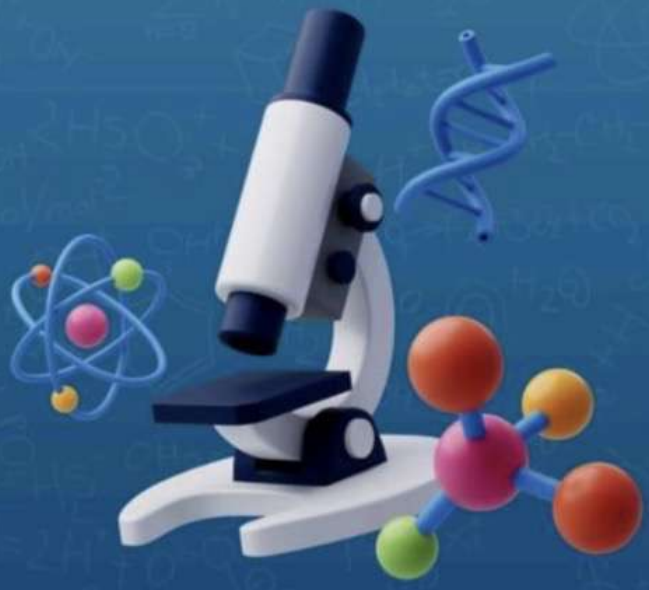

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Department of Chemistry
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Department of Chemistry

Electrochemical investigation of an lSNO based supercapcitor with high specific Capacitance and Energy Density

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Abstract

The development of high-performance supercapacitors with enhanced energy density and long-term stability is essential to meet the growing demand for efficient energy storage systems. In this work, we report the electrochemical performance of an LSNO-based electrode material investigated for supercapacitor applications using an symmetric supercapacitor (SC) configuration. Cyclic voltammetry measurements conducted within a potential window of 0–0.6 V at various scan rates reveal quasi-rectangular shapes with distinct redox features, indicating Faradaic pseudocapacitance. Galvanostatic charge–discharge studies demonstrate nearly symmetric charge–discharge profiles, confirming good electrochemical reversibility and stable charge storage behavior. The device delivers a high specific capacitance of 403 F g^{-1}, reflecting efficient utilization of electroactive sites and rapid ion transport. The symmetric supercapacitor exhibits a high energy density of 72.54 Wh kg^{-1} with a corresponding power density of 749 W kg^{-1}, highlighting its excellent energy–power balance. Electrochemical impedance spectroscopy reveals low internal resistance and favorable charge-transfer kinetics, which contribute to the superior electrochemical performance. Furthermore, the device shows excellent cycling stability, retaining approximately 85% of its initial capacitance after 3000 charge–discharge cycles. Charge balance between the positive and negative electrodes was optimized to ensure stable operation and prevent electrode degradation. Compared with previously reported perovskite-based supercapacitor materials, the present system exhibits significantly enhanced electrochemical performance, demonstrating its strong potential for next-generation high-energy supercapacitor applications.

Key words: Electrochemical studies, Perovsikte, Transition Metal Oxide, Supercapacitor.

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