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Mn3O4 anchored Broccoli-Flower like Nickel Manganese Selenide Composite for Ultra-efficient Solid-State Hybrid Supercapacitors with Extended Durability

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Abstract : Innovative renewable energy sources for energy storage/conversion is the demand of the current scenario in electrochemical machinery. In this context, choosing suitable organic precipitants for tuning the crystal characteristics and microstructures is a challenge. On the same note, herein we report broccoli flower-like porous Mn3O4/NiSe2−MnSe2 composite synthesized using a simple two step hydrothermal synthesis procedure assisted by sluggish precipitating agent and an effective cappant followed by intermediated anion exchange. The as-synthesized material was exposed to physical and chemical measurements depicting poly-crystallinity, stronger bonding and broccoli flower-like porous arrangement. The material was assessed electrochemically by cyclic voltammetry (CV), chronopotentiometry (CP) and electrochemical impedance spectroscopy (EIS) measurements. The Electrochemical studies reveal redox behavior, supercapacitive charge-discharge shape and extremely low charge transfer resistance. Further, the fabricated Mn3O4/NiSe2−MnSe2 composite based solid-state hybrid supercapacitor (Mn3O4/NiSe2−MnSe2 ||N-rGO) delivers excellent rate specific capacity, very low internal resistance, with energy density (~34 W h kg–1) of a typical rechargeable battery and power density (11995 W kg–1) of an ultra-supercapacitor. Consequently, it can be a favorable contender for supercapacitor applications for high performance energy storage utilizations. A definitive exhibition of the supercapacitor device is credited to electrolyte-ion buffering reservior alike behavior of broccoli flower like Mn3O4/NiSe2−MnSe2, enhanced by upgraded electronic and ionic conductivities of N- doped rGO (negative electrode) and PVA/KOH gel (electrolyte separator), respectively

Keywords : electrolyte-ion buffering reservoir, intermediated-anion exchange, solid-state hybrid supercapacitor, supercapacitive charge-dischargesupercapacitive charge-discharge
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