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(54) Title of the invention : FABRICATION OF HIGH-PERFORMANCE SYMMETRICAL COIN CELL SUPERCAPACITORS BY USING POLY(3,4-ETHYLENEDIOXYTHIOPHENE): POLYSTYRENE SULFONATE/ MAGNESIUM OXIDE (PEDOT:PSS/MGO) COMPOSITE ELECTRODES

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(57) Abstract :

The present invention relates to a fabrication method of high-performance symmetrical coin cell supercapacitors by using Poly(3,4-ethylenedioxythiophene): polystyrene sulfonate/ magnesium oxide (PEDOT:PSS/MgO) composite electrodes, resulting in improved electrochemical performance. The fabrication method comprises the steps: synthesis of poly [(3,4-ethylenedioxy) thiophene]:polystyrene sulfonate (PEDOT:PSS); nano MgO powder gently added to PEDOT:PSS under magnetic stirring for 6 hours; a thin film of composite prepared through drying process in petri dish at 60°C oven for 12 hours and pounded into powder using a mortar and pestle; dissolve the powder of PEDOT:PSS/MgO , carbon black, and PVDF binder in a weight ratio of 8:1:1 in 3 mL of N-Methylpyrrolidone in an ultrasonic bath to achieve a homogeneous mixture; prepare an ink-like slurry by mashed the mixture by mortar and pestle; A layer of active material was applied to one side of the polished copper (Cu) sheet and one side of to an Aluminium (Al) sheet with an area of 1 cm² using the Doctor's blade technique; both the sheet were then heated at 80°C overnight to eliminate the solvent; and The material was shaped into a circular form with a diameter of 16 mm and prepared to be compatible with CR2032 type coin cells. The symmetric supercapacitor was created using identical electrode materials for both the anode and cathode. The symmetrical supercapacitor outperforms ordinary supercapacitors with 1.3 Wh/kg energy density and 5514 W/kg power density. PEDOT:PSS/MgO supercapacitor device was used to power an Arduino-based temperature sensor device.

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