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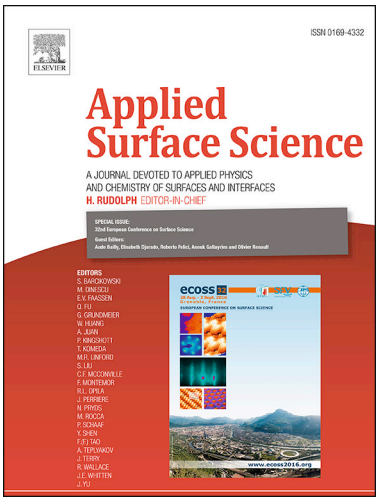

Full Length Article

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Sprayed Bismuth Oxide Interconnected Nanoplates Supercapacitor Electrode Materials

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Abstract

The present article we report synthesis and electrochemical supercapacitor application of sprayed bismuth oxide (Bi_2O_3) inter-connected upright standing nano-plates *via* a simple spray pyrolysis aqueous route onto a flexible 3D Ni-foam at 623±2 K. The Bi_2O_3Ni-foam was initially characterized for the structure, morphology and phase-purity analyses and then envisaged as electrode materials in supercapacitor application. Polycrystalline, cubic crystal structure nanoplates of Bi_2O_3 nanoplates were hydrophobic in character. The cyclic voltammetry curves of Bi_2O_3 electrode, scanned at various scan rate like 5 and 1000 mV/s in 1 M Na_2SO_4, in the potential window – 0.8 to 1.9 V *vs.* Ag/AgCl confirm mixed capacitive behavior. Using charge-discharge study, the calculated maximum values of specific energy, specific power and columbic efficiency were 702.97 Wh/kg, 334.7 kW/kg and 99.9%, respectively. Electrochemical impedance measurement scanned in the frequency range of 1 mHz —1 MHz confirms ~6 Ω solution resistance and ~13 Ω charge transfer resistance. An excellent electrochemical stability of 92 % at 100 mV/s scan rate even after 5000 redox cycles demonstrates an industrial potential of Bi_2O_3 electrode materials.

Keywords: Spray Pyrolysis; Bismuth oxide; Nameplates; Electrochemical supercapacitors.

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Introduction