Abstract

The fabrication of zinc-tin oxide composite electrodes and thin films was accomplished by the utilization of a locally developed spray pyrolysis apparatus. The thin films were subjected to characterization using X-Ray Diffraction (XRD), which indicated that an increase in concentration resulted in a transition towards an amorphous structure. The presence of Zinc and Tin Oxide vibrations was confirmed through the utilization of Fourier Transform Infrared Spectroscopy (FTIR). The electrochemical characteristics of composite electrodes containing Zinc Tin Oxide at different concentrations were evaluated using three experimental techniques: Cyclic Voltammetry (CV), Galvanostatic Charge Discharge (GCD), and Electrochemical Impedance Spectroscopy (EIS). These evaluations were conducted in a 6M KOH electrolyte solution. The ZS-2 electrode demonstrated the largest specific capacitance, measuring 726 F/g at a scan rate of 5 mV/s, and a capacitance of 315 F/g with a current density of 0.5 Ag^{-1} based on galvanostatic charge-discharge (GCD) experiments. The remarkable electrochemical characteristics exhibited by the Zinc tin oxide composites indicate their prospective application as electrode materials in supercapacitors with high energy density.