Abstract

In the current study, thin films made of Co_2MnO_4 were deposited onto glass slides and nickel foam substrates by spray pyrolytic deposition using an aqueous technique at a temperature of 400 degrees Celsius. X-ray diffraction (XRD) and Fourier-transform infrared spectroscopy (FTIR) were utilized to perform structural and chemical analysis on the slides that were produced. The pseudo-capacitive properties were discovered as a result of the electrochemical experiment. When the scan rate was set to 5 mVs^{-1}, the maximum achieved specific capacitance value is 1716 Fg^{-1}. Similarly, a specific capacitance of 1194.33 Fg^{-1} was found in a 6 M KOH electrolyte at a current density of 1 Ag^{-1} with 75% manganese incorporation in cobalt oxide. The fact that composites made of Co_2MnO_4 possessed remarkable electrochemical characteristics hints at the possibility that these materials could be useful as electrodes in supercapacitors that have a substantial amount of energy density. In addition, it was discovered that the addition of manganese (Mn) to cobalt oxide led to an increase in the specific capacitance of the material that was initially composed of cobalt oxide. This was an unexpected finding. For the purpose of the experiment, electrochemical impedance spectroscopy was carried out throughout a frequency spectrum ranging from 0.1 to 1000 Hz. This research came to the conclusion that the power density of 33.59 $WhKg^{-1}$ and the energy density of 2025 WKg^{-1} were the maximum possible values. Because of their remarkable electrochemical performance, the findings of this work suggest that Co_2MnO_4 composites have a significant amount of untapped potential for use in the development of practical supercapacitors.