A glassy carbon electrode modified with tailored nanostructures of cobalt oxide for oxygen reduction reaction

ABSTRACT

Herein we report on various surface morphological characteristics of the synthesized cobalt oxide (Co3O4) nanostructures obtained by means of facile one-step hydrothermal method for oxygen reduction reaction (ORR). The synthesized nanostructures of Co3O4 were adequately characterized by field emission scanning electron microscopy (FESEM) fitted with Energy-dispersive X-ray spectroscopy (EDX) elemental mapping, X-ray diffraction (XRD) and Raman techniques. The electrochemical studies were carried out to analyse the performance of as-synthesized catalysts for ORR by cyclic voltammetry (CV), and chronoamperometric (CA) techniques. A higher electrocatalytic response was observed for Co3O4 nanocubes compared with all the other controlled electrodes by CV with a current density of 0.69 mA/cm2 at a potential value of −0.46 V. The as-synthesized material showed adequate tolerance against methanol observed by CV in the presence of 0.5 M methanol, and good stability when compared with commercial Pt/C catalyst using the CA technique.

Keyword: Cobalt oxide; Hydrothermal; Electrochemical; Oxygen reduction reaction; Fuel cell