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Corrosion Protection of 304 Stainless Steel Bipolar Plates of PEMFC by Coating SnO_2 Film

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Tin oxide (SnO_2) film was successfully coated on surface of austenite 304 stainless steels (304SS) by combining sol-gel dip-coating method with alcohol thermal method. The coated SnO_2 film was used to enhance corrosion resistance of 304SS bipolar plates in a simulated proton exchange membrane fuel cell (PEMFC) environment. Bared 304SS and SnO_2 coated 304SS were investigated via EIS, potentiodynamic polarization curves and potentiostatic polarization curves measurements in a simulated PEMFC cathodic, anodic environment, respectively. Compared with the bared 304SS, the corrosion current density for the SnO_2 coated 304SS was decreased significantly from 33.22 μA/cm^2 to 0.1327 μA/cm^2 in a simulated cathodic environment, and from 75.079 μA/cm^2 to 0.1581 μA/cm^2 in a simulated anodic environment. Surface structure and chemical composition of the samples were obtained by SEM, EDX, AFM, XRD and XPS. The result showed that a uniform and compact SnO_2 film was coated on the surface of 304SS, which enhanced the corrosion resistance of 304SS in a simulated PEMFC environment.

Keywords: Proton exchange membrane fuel cell (PEMFC); 304 stainless steel; bipolar plate; tin oxide (SnO_2) film; corrosion

FULL TEXT