Influence of Electroplating Parameters on Microstructure and Amount of Ceramic Particle Deposition in Ni-Co-CeO2 Composite Coating

Afsaneh Afzali Gorouh, Morteza Zandrahimi [*], Hadi Ebrahimifar

Department of Metallurgy and Materials Engineering, Faculty of Engineering, Shahid Bahonar University of Kerman, Jomhoori Eslami Blvd., 76169-133, Kerman, Iran.

ARTICLE INFO

Keywords:

Electroplating
Microstructure
Composite coating
CeO2

ABSTRACT

Chromium alloy steels are the best choice for materials used in interconnect plates used in solid oxide fuel cells. At operating temperature of solid oxide fuel cells chromium can alert to unstable Cr+6 species. These unstable species can precipitate at the cathode site, causing cathode contamination and reducing cathode efficiency. Therefore, protection of these steels at high temperatures is essential. Therefore, applying surface coatings it is one of the best effective methods to extend the life of these components against oxidation. In this study, Ni-Co-CeO2 composite coating was created by direct electrodeposition on the surface of AISI 430 ferritic stainless steel. In order to obtain proper coating, the effect of parameters of CeO2 particle concentration, current density and pH in the bath was investigated. Influence of CeO2 content (5, 10, 15 and 20 g/L), current density (15, 17, 20 and 22 mA/cm2) and pH (2.5, 3, 3.5 and 4) on the amount of CeO2 ceramic particle deposition and microstructure of coating was investigated. Scanning electron microscopy (SEM) and EDX analysis were used to determine the morphology of Ni-Co-CeO2 composite coating. The results showed that with increasing CeO2 and pH the amount of CeO2 particle deposition increased and then decreased. Also with increasing current density the deposition of CeO2 particles decreased.

[*] Corresponding author:
E-mail address: morteza.zandrahimi@gmail.com