Study of Anodic Electrodeposition of CeO₂ Thin Film Using Electrochemical Noise Technique

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The anodic electrodeposition of CeO₂ thin film was studied by means of cyclic voltammetry (CV), electrochemical noise (EN) analysis, scanning electron microscopy (SEM) and XRD. The CV results reveal that the electroplating behavior of CeO₂ on 316L stainless electrode is mainly electrochemical-controlled. It is found that the potential moves in the positive direction slowly when the electroplating current density (J_k) is small (0.01-0.05 mA·cm⁻²) and moves quickly in the positive direction to reach a plateau in the case of much larger J_k value, suggesting a progressive and instantaneous nucleation/growth mechanism, respectively. New parameters are proposed from EN analysis to investigate the relationship between the EN feature and the CeO₂ thin film structure. It is interesting to infer that parameter n_2 presented the same variation trend with the crystallite size from the XRD measurements with the electroplating current density.

Keywords: CeO₂ thin film; Electrodeposition; Electrochemical noise; deposit structure

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