

عنوان مقاله:

Electrochemical anodizing of galvanized mesh for photoelectrochemical cathodic protection of stainless steel ۳۰۴

محل انتشار:

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خلاصه مقاله:

Corrosion is an electrochemical process that changes the properties of the metal and its surrounding environment. The main corrosion factor in metals is the presence of oxidizing species. The most important method for corrosion protection is cathodic protection. Cathodic protection is done by passing an electric current through the metal that is in the electrolyte environment. Photoelectrochemical cathodic protection (PEC) is considered as an environmentally friendly method for metal corrosion today. The light source of the sun and photocatalysts are two creation factors (PEC). Semiconductors are used in this method. Semiconductors are used for (PEC) due to their high photoelectric properties and chemical stability, as well as their low price and nontoxicity. Zinc Oxide is thermodynamically relatively stable and has the characteristics of a semiconductor, a straight and wide band gap, which is suitable for short wavelength optical applications [۱,۲]. Therefore, in this work, because of its low price and the aforementioned characteristics, galvanized mesh was anodized to be employed in PEC application. Galvanized mesh was anodized at constant voltage of ۱۰ volts at various anodizing times (۱,۵, ۱۰, ۱۵, and ۲۰ minutes) in electrolyte containing ۰.۰۵ M NaHCO<sub>3</sub> aqueous solution followed by calcination at various temperatures of ۴۰۰, ۵۰۰, and ۶۰۰ °C for ۱۰ h. Then, in a setup presented in Fig. ۱, the obtained photoanodes were placed in a solution containing ۰.۲ M NaOH and ۰.۱ M sodium sulfide which connected to stainless steel (SS) ۳۰۴ inside of ۳.۵% W/W NaCl [۳]. These experiments were performed once in the absence of light and once under xenon light irradiation. The Photoelectrochemical cathodic protection ability of the obtained photoanode samples was investigated by Tafel test in open circuit potential (OCP). According to Fig. ۲, the results of the Tafel tests of the samples showed that the Galvanized-mesh anodized for ۲ minutes and calcinated at temperature of ۶۰۰ °C under the light of a xenon lamp irradiation has more negative corrosion potential with higher polarization current density compared [to other samples, showing its excellent photocathodic protection ability for SS ۳۰۴ alloy [۴,۵,۶].

کلمات کلیدی:

Photoelectrochemical cathodic protection, Galvanized mesh, Electrochemical anodizing, Stainless steel ۳۰۴

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