

## عنوان مقاله:

Studying the Correlation Between Corrosion Resistance with Surface Roughness and Wettability of Plasma Electrolytic Oxidation Coatings on Pure Titanium Using design of Experiments by Taguchi Method

## محل انتشار:

مجله علوم و مهندسی خوردگی، دوره 12، شماره 46 (سال: 1401)

تعداد صفحات اصل مقاله: 16

## نویسنده:

## خلاصه مقاله:

The aim of this research is to investigate the effect of  $\gamma$  variables of the plasma electrolytic oxidation (PEO) coating process, including the concentration of calcium acetate and potassium hydroxide salts of the electrolyte, frequency, current density, duty cycle, treatment time, and the distance between the anode and cathode on the corrosion current density of the coatings and studying the correlation between the corrosion resistance with the surface roughness and wettability of the coatings on pure titanium using the Taguchi design of experiments method. The surface roughness of the coatings was evaluated with the help of a surface profilometer and their wettability was assessed by measuring the contact angle of their surface with a drop of water. The corrosion resistance of the coatings was investigated using the potentiodynamic polarization test after 22 hours exposure of the samples to Ringer's physiological solution. The surface structure and chemical composition of the optimal coating were studied by a scanning electron microscope and X-ray diffractometer, respectively. The results showed that duty cycle and frequency were the most effective and the least important variables on the corrosion current density of coatings, respectively. Also, the optimal conditions for forming a coating with the lowest corrosion current density ( $0.0018 \mu\text{A}/\text{cm}^2$ ), included the concentration of 7.5 and 3 g/l of calcium acetate and potassium hydroxide salts in the electrolyte, respectively, frequency of 2000 Hz, current density of 5 A/dm<sup>2</sup>, duty cycle of 50%, treatment time of 15 minutes, and the distance between anode and cathode of 3 cm. In general, the corrosion resistance of the coatings decreased with the increase in their surface roughness and wettability.

## کلمات کلیدی:

Plasma electrolytic oxidation, corrosion, titanium, design of experiments, potentiodynamic polarization, اکسیداسیون الکترولیتی پلاسمایی، خوردگی، تیتانیوم، طراحی آزمایش ها، پلاریزاسیون پتانسیودینامیک.

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