Ketahanan Korosi Biomaterial Ti-6Al-4V Setelah Anodisasi di Dalam Elektrolit Kalsium Hidroksida = Corrosion Resistance of Ti-6Al-4V Anodized in Calcium Hydroxide Electrolyte

Alvin Muhammad Habieb, author

Abstrak

Karakteristik lapisan anodik oksida hasil anodisasi sangat dipengaruhi oleh jenis elektrolit dan input tegangan yang digunakan selama proses anodisasi. Pada penelitian ini dilakukan anodisasi paduan Ti-6Al-4V di dalam larutan kalsium hidroksida pada kondisi variasi tegangan 10, 20, dan 30 V. Penelitian ini bertujuan untuk menganalisis perilaku korosi paduan akibat perlakuan anodisasi. Proses anodisasi dilakukan pada suhu 25°C selama 20 detik. Proses anodisasi direkam dengan menggunakan digital multimeter untuk menghasilkan kurva arus terhadap waktu anodisasi. Karakterisasi komposisi fasa dan unsur yang terbentuk setelah anodisasi dilakukan dengan uji XRD and EDS. Uji korosi dilakukan dengan metode elektrokimia menggunakan mode: open circuit potential (OCP), polarisasi potensiodinamik (PDP), dan spektroskopi impedansi (EIS). Dari hasil karakterisasi komposisi unsur menggunakan EDS menunjukkan fasa Oksigen yang tinggi pasca anodisasi menandakan bahwa pembentukan lapisan oksida telah terbentuk. Hasil kekerasan Vickers menunjukkan bahwa nilai kekerasan sampel Ti-6Al-4V berada pada rentang 325-380 HV. Sampel dengan variasi tegangan tertinggi (30V-Ca) memiliki ketahanan korosi tertinggi (Icorr=1,16 x10-6A/cm2; Ecorr=-0,18 V). Dalam uji imersi selama 31 hari pada larutan Ringer yang dimodifikasi belum terlihat fasa apatit dalam hasil XRD, hal ini dikarenakan permukaan paduan logam titanium yang inert baik sebelum dan setelah proses anodisasi.

.....The characteristics of the anodized anodic oxide layer are strongly influenced by the type of electrolyte and the input voltage used during the anodization process. In this study, the anodization of Ti-6Al-4V alloy in calcium hydroxide solution was conducted under various stress conditions of 10, 20, and 30 V. This study analyzed the corrosion behavior of the alloy due to anodizing treatment. The anodization process was conducted at a temperature of 25°C for 20 seconds. The anodization process was recorded using a digital multimeter to produce a current versus anodization time curve. The characterization of the phase and elemental compositions formed after anodization was conducted using XRD and EDS tests. Corrosion tests were conducted by electrochemical methods using the following modes: open circuit potential (OCP), potentiodynamic polarization (PDP), and impedance spectroscopy (EIS). The results of the characterization of elemental composition using EDS showed a high oxygen phase after anodization, indicating that the formation of an oxide layer had been formed. The sample with the highest voltage variation (30V-Ca) had the highest corrosion resistance (Icorr=1.16 x10-6A/cm2; Ecorr=-0.18 V). In the immersion test for 31 days in the modified Ringer's solution, the apatite phase was not visible in the XRD results, which was due to the inert surface of the titanium metal alloy both before and after the anodization process