Effect of time in plasma electrolytic oxidation process on titanium substrate with addition nano alpha alumina powder in electrolyte and investigate wear behavior of coating

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The plasma electrolytic oxidation is a novel method to create ceramic coatings on metals and improve wear resistance of metals. In this research, nano alpha-alumina powders were added to the electrolyte to create a ceramic coating on titanium substrate. Coating mechanism with nano powders in electrolyte is composition of cataphoretic effect and spark ignition. Three samples with 10, 20 and 30 min process time and constant parameters of bipolar condition, 0.2 A/cm\textsuperscript{2} current density, 50\% duty cycle and 50Hz frequency were created. Wear properties of coatings was investigated by pin on disk method and also friction coefficient and weight changes were calculated. SEM and EDS tests were used to study the microstructure and chemical composition of coating and wear route. Results showed that nano alpha-alumina powders because of high hardness have a significant role in improving the wear properties of coating. With increasing time of PEO process, nano particles adhere better to coating because of more sintering time and the other hand, due to the increase thickness of the coating with increasing time of process, discharging channels and roughness will be greater. Scanning electron microscope images showed that the sample with a coating time of 30 min, due to great surface roughness has been worn more than 10 and 20 min process time samples.

Keywords
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