Effect of Al₂O₃ Particle Concentration on the Characteristics of Microarc Oxidation Coatings Formed on Pure Titanium

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Microarc oxidation coatings were successfully fabricated on pure titanium substrates by microarc oxidation (MAO) in electrolytes with Al₂O₃ particles of varying concentrations, which ranged from 0 to 4 g·L⁻¹ (0, 1, 2, 3, 4 g·L⁻¹). The voltage versus time curves, surface and cross-sectional morphologies, thicknesses, microhardnesses, phase compositions, coating adhesive strengths, thermal shock resistances and polarization curves of MAO coatings were investigated. The results revealed that the voltage, the microhardness and the thickness of the coatings increased with the addition of Al₂O₃ particles. Both the number and size of sintered discs on the coating surface increased gradually with the ascending concentration of Al₂O₃ particles. The XRD results indicated that the MAO coatings mainly consisted of α-Al₂O₃, SiO₂ and rutile. The corrosion resistance of the coatings was improved, while the addition of Al₂O₃ particles had less effect on the adhesive strength of the MAO coatings. The study revealed that an appropriate addition of Al₂O₃ particles in electrolytes is beneficial to promote the performance of coatings..

Keywords: Microarc oxidation; Pure titanium; Al₂O₃ particles; Performance

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