Effect of Bi₂S₃ on Characteristics of Micro-arc Oxidation Coating formed on TC4 Alloy

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Micro-arc oxidation coatings were formed on a TC4 surface with different Bi₂S₃ concentrations (0-0.2 g·L⁻¹). The influences of Bi₂S₃ on the micro-structure, phase composition, and corrosion resistance of the prepared coatings were investigated by scanning electron microscopy (SEM), X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), and electrochemical workstation. In this research, the MAO voltage first increases and then decreases with an increasing Bi₂S₃ concentrations, which results in similar changes in the thickness and hardness of the coating. XRD and XPS results show that the phase composition of the coating mainly consists of rutile, anatase and Bi₂O₃. The combined result of an increased coating thickness and the presence of anatase promotes coating densification, thereby increasing the corrosion resistance of the coating. Electrochemical polarization curve and impedance results show that the coating has the best corrosion resistance when the Bi₂S₃ concentration is 0.1 g·L⁻¹. Therefore, the addition of Bi₂S₃ optimizes the microstructure of the MAO coating and enhances its comprehensive properties.

Keywords: Micro-arc oxidation; TC4; Bi₂S₃ particles; Corrosion resistance.

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