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INFLUENCE OF COUNTER-SAMPLE MATERIAL (Al_2O_3, ZrO_2, SiC AND WC) ON THE TRIBOLOGICAL PROPERTIES OF PEO COATINGS FORMED ON AZ31B MAGNESIUM ALLOY

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Abstract:

The article presents tribological investigations of oxide coatings produced on AZ31B magnesium alloy by Plasma Electrolytic Oxidation (PEO), a promising method for improving the protective and operational properties of lightweight magnesium alloys. The coatings were obtained using identical process parameters, including a trapezoidal voltage waveform and a three-component alkaline electrolyte. The oxidation process was carried out under constant conditions: a peak current density of 12 A/dm², an oxidation time of 10 minutes, and a pulse frequency of 100 Hz, thereby enabling the formation of uniform oxide coatings with protective properties. The tribological performance of the coatings was evaluated using a T-01M tribotester under technically dry friction conditions in a ball-on-disc configuration. Ceramic balls made of Al_2O_3, ZrO_2, SiC, and WC were used as counter-sample materials, enabling analysis of the influence of counter-sample type on the coefficient of friction and wear mechanisms of the investigated coatings. The study was supplemented with profilometric measurements of surface topography before and after tribological testing, evaluation of coating thickness, and microscopic analysis of the coating. The results indicate that the type of counter-sample material significantly affects friction and wear processes as well as the wear resistance of the oxide coatings. The findings will help identify the most favourable tribological pairings and contribute to a better understanding of the wear mechanisms of PEO coatings on magnesium alloys. These studies may support further optimisation of the operational parameters of protective oxide coatings for industrial applications.