Pengaruh Aditif Silikon Dioksida dan Post-Alkali Treatment Terhadap Nilai Spesifik Abrasi, Kekerasan, dan Korosi Lapisan Hasil Plasma Electrolytic Oxidation Pada Logam Magnesium dan Titanium = The Effect of Silicon Dioxide Additives and Post-Alkali Treatment on Spesific Abration, Hardness, and Corrosion of Plasma Electrolytic Oxidation Layers on Magnesium and Titanium Metals

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Abstrak

<p>Plasma electrolytic oxidation (PEO) merupakan metode konversi permukaan logam menjadi lapisan oksida dengan bantuan plasma yang bertujuan untuk meningkatkan sifat mekanik permukaan dan ketahanan korosi logam. Retakan dan pori menurunkan ketahanan korosi dan sifat mekanik lapisan. Dalam penelitian ini digunakan zat aditif SiO₂dan metode post-alkali treatment pada lapisan PEO yang ditumbuhkan pada paduan magnesium AZ31 dan commercially pure titanium (CP-Ti). PEO dilakukan di dalam larutan 95 g/l Na₃PO₄+ 2 g/l KOH menggunakan rapat arus DC sebesar 300 A.m⁻² selama 10 menit. NP-SiO₂ sebanyak 2 g/l ditambahkan di dalam larutan PEO. Setelah logam terlapisi, post-alkali treatment dilakukan di dalam larutan 0,5 M NaOH pada suhu 80 ºC selama 30 menit. Morfologi permukaan dan kandungan unsur lapisan dianalisis menggunakan SEM-EDS dan XPS. Komposisi fasa kristal diteliti menggunakan X-ray Difraction (XRD). Sifat mekanik lapisan PEO diuji dengan metode vickers microhardness dan ketahanan aus dievaluasi menggunakan metode Ogoshi. Sifat korosi dianalisis dengan uji polarisasi, EIS, dan uji rendam. Sifat bioaktivitas diteliti dengan cara perendaman sampel dalam larutan SBF. Hasil penelitian menunjukkan penambahan aditif SiO₂ dan post-alkali treatment dapat meningkatkan ketahanan korosi dan sifat mekanik lapisan PEO pada logam Mg dan Ti. Pada PEO-Mg, lapisan PEO/SiO₂+AT memiliki nilai rapat arus korosi paling rendah dan nilai kekerasan paling tinggi dibandingkan dengan sampel lainnya yaitu berturut-turut 7,34x10⁻⁷A.cm⁻² dan 359 HV. Tren yang sama juga dihasilkan pada PEO-Ti, lapisan PEO/SiO₂+AT memiliki nilai rapat arus korosi relatif rendah dan nilai kekerasan paling tinggi dibandingkan dengan sampel lainnya yaitu berturut-turut 3,4x10⁻⁹ A.cm⁻²dan 305 HV.

.....Plasma electrolytic oxidation (PEO) is a method of converting metal surfaces into an oxide layer with the help of plasma which aims to improve the surface mechanical properties and corrosion resistance of metals. Cracks and pores reduce the corrosion resistance and mechanical properties of the coating. In this research, SiO₂ additives and post-alkali treatment methods were used on PEO layers grown on AZ31 magnesium alloy and commercially pure titanium (CP-Ti). PEO was carried out in a solution of 95 g/l Na₃PO₄ + 2 g/l KOH using a DC current density of 300 A.m⁻² for 10 minutes. SiO₂ additive with a concentration of 2 g/l was added to the PEO solution. After the metal is coated, post-alkali treatment is carried out in a 0.5 M NaOH solution at a temperature of 80 ºC for 30 minutes. The surface morphology and element content of the layers were analyzed using SEM-EDS and XPS. The composition of the crystal phase was investigated using XRD. The mechanical properties of

the PEO coating were tested using the vickers microhardness and the wear resistance was evaluated using the Ogoshi method. Corrosion properties were analyzed by polarization test, EIS, and immersion test. The bioactivity properties were studied by immersing the samples in SBF. The research results show that the addition of SiO₂ and post-alkali treatment can improve the corrosion resistance and mechanical properties of PEO layers on Mg and Ti metals. In PEO-Mg, the PEO/SiO²+AT layer has the lowest corrosion current density value and the highest hardness value compared to other samples, namely 7.34x10⁻⁷ A.cm⁻² and 359 HV respectively. The same trend was also produced on PEO-Ti, the PEO/SiO²+AT layer had a relatively low corrosion current density value and the highest hardness value compared to other samples, namely 3.4x10⁻⁹ A.cm⁻² and 305 HV respectively.</p>