Karakteristik Coating yang Ditumbuhkan dengan Metode Plasma Electrolytic Oxidation Pada Paduan AZ31B: Pengaruh Aditif Etanol di dalam Elektrolit = Coating Characteristic of Plasma Electrolytic Oxidation on AZ31B Magnesium Alloy: Effect of Additive Ethanol in Electrolytes

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Abstrak

Plasma electrolytic oxidation (PEO) merupakan metode rekayasa permukaan logam untuk menghasilkan lapisan oksida yang keras dan tahan korosi. Sifat lapisan oksida yang dihasilkan bergantung pada jenis substrat dan komposisi larutan yang digunakan. Dalam penelitian ini, PEO dilakukan pada substrat AZ31B pada kondisi rapat arus tetap 800 A/m2 dan suhu 30°C. Larutan terdiri atas campuran garam basa dan etanol. Larutan A terdiri atas campuran 0,5 M Na3PO4 dan etanol dengan komposisi 9:1, larutan B campuran Na3PO4, NaOH dan Na2CO3 dengan komposisi 8:1:1, larutan C, D, dan E campuran Na3PO4, NaOH, Na2CO3, dan etanol dengan komposisi 7:1:1:1, 6:1:2:1, dan 6:2:1:1. Morfologi dan komposisi lapisan oksida diamati dengan scanning electron microscope dan energy dispersive spectroscopy (SEM – EDS). Komposisi kristal dianalisis dengan x-ray diffraction (XRD). Nilai kekerasan mekanik diuji dengan mesin microVickers Hardness. Perilaku korosi sampel diuji dengan metode electrochemical impedance spectroscopy (EIS) dan potentiodynamic polarization (PDP). Etanol di dalam larutan tidak mempengaruhi morfologi dan komposisi coating. Semua coating memiliki kandungan fasa kristal Mg3(PO4)2 pada puncak 29° hingga 35°. Nilai kekerasan coating yang terbentuk di larutan A, B, C, D, dan E adalah 451,8; 388; 237; 156,8; 158,4 HV. Nilai kekerasan yang rendah pada coating C, D, dan E disebabkan oleh rendahnya konsentrasi Na3PO4 yang menurunkan populasi plasma selama proses coating. Selain itu, kehadiran ion karbonat di dalam larutan mentriger peningkatan pori di dalam coating. Hasil uji polarisasi menunjukkan peningkatan ketahanan korosi dua orde dibanding substrat. Penambahan etanol ke dalam larutan cenderung menurunkan sedikit ketahanan korosi coating.

.....Plasma Electrolytic Oxidation (PEO) is a method of engineering metal surface treatment to produce a hard and corrosion-resistant oxide layer. The result properties of oxide layer depend on type of substrate and composition solution was used. PEO process is carried out a constant current 800 A/m2 at temperature 30. The solution composed of mixture alkaline salts and ethanol. Solution A mixture of 0,5 M Na3PO4 and ethanol with composition of 9:1, solution B a mixture Na3PO4, NaOH and Na2CO3 with composition of 8:1:1, solution C, D, and E a mixture of Na3PO4, NaOH and Na2CO3 with ethanol with composition of 7:1:1:1; 6:1:2:1; and 6:2:1:1. Morphology and composition of the oxide layer were observed by scanning electron microscope and energy dispersive spectroscopy (SEM – EDS). The crystal composition was analyzed by x-ray diffraction (XRD). The value of mechanical hardness was tested with a microVickers Hardness machine. The corrosion behavior of the samples was tested by electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization (PDP) methods. The presence of ethanol in the solution didn’t affect morphology and composition of coating. All coatings contain Mg3(PO4)2 crystal phase at peak 29° to 35°. The hardness value of coating formed in solution A, B, C, D and E is 451.8; 388; 237; 156.8; 158.4 HV. The low hardness values in coatings C, D, and E were caused by the low

concentration of Na_3PO_4 which reduced plasma population during the coating process. In addition, the presence of carbonate ions in the solution triggers an increase in the pores in the coating. The results of the polarization test showed can increase corrosion resistance of two orders compared to substrate. Addition of ethanol to solution tends to slightly lower the corrosion resistance of coating.