Analisis perubahan struktur mikro, kekerasan, dan sifat korosi paduan AA7075-T651 yang diberi perlakuan panas = Analysis on alteration of microstructure, mechanical hardness, and corrosion properties of AA7075-T651 alloy as a result of heat treatment

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Abstrak

ABSTRAK
Berbagai macam perlakuan panas pada paduan AA7075-T651 telah diteliti mampu memberikan hasil yang bervariasi baik menguntungkan maupun merugikan. Adapun pengaruh perlakuan panas tempo singkat terhadap AA7075-T651 dalam penggunaan di lapangan masih belum banyak diteliti. Skripsi ini membahas pengaruh perlakuan panas terhadap paduan AA7075-T651 pada suhu 300 derajat C, 400 derajat C, 500 derajat C, dan 600 deraqjat C dengan durasi pemanasan tiap suhu 1 jam. Perubahan struktur mikro diamati menggunakan scanning electron microscope dan energy dispersive X-ray spectroscopy (SEM-EDS). Perubahan kekerasan diamati melalui uji kekerasan Vickers. Perubahan sifat korosi diteliti dengan metode polarisasi diantaranya open-circuit potential (OCP), electrochemical impedance spectroscopy (EIS), dan potentiodynamic polarization; serta metode hilang berat. Perubahan struktur mikro paduan AA7075-T651 sebagai hasil perlakuan panas mengubah kekerasan dan sifat korosi paduan. Fasa Mg-rich stabil setelah dipanaskan pada suhu 300 derajat C dan 400 derajat C lalu sebagian larut dan hilang pada suhu 500 derajat C dan 600 derajat C. Fasa Fe-rich tetap stabil setelah perlakuan panas. Kekerasan paduan setelah dipanaskan menurun dari 136 HV menjadi hingga 78,5 HV dipengaruhi oleh perubahan distribusi presipitat dan kerapatan partikel dari 18,0 x 104 partikel/mm2 menjadi hingga 5,8 x 104 partikel/mm2. Meningkatnya kerapatan partikel menyebabkan peningkatan kekerasan dan konduktivitas listrik tetapi kekerasan setelah perlakuan panas menurun karena disolusi presipitat metastabil. Penurunan kerapatan partikel memicu penurunan kekerasan dan konduktivitas listrik. Konduktivitas listrik tertinggi bernilai 418 x 106 (Ω.m) -1 didapat setelah pemanasan pada suhu 500 derajat C sedangkan nilai terendah didapat setelah pemanasan suhu 600 derajat C yaitu 4,22 x 106 (Ω.m) -1. Laju korosi tertinggi diperoleh setelah paduan dipanaskan pada suhu 300 derajat C yaitu 45,12 mmpy diikuti morfologi korosi berupa korosi eksfoliasi. Laju korosi terendah diperoleh setelah pemanasan suhu 600 derajat C diikuti morfologi korosi mikrogalvanik yang menyerang matriks di sekitar batas butir.
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ABSTRACT
Various types of heat treatment on AA7075-T651 alloys have been investigated capable of providing varied results both beneficial and detrimental. However, the effect of short-term heat treatment on AA7075-T651 in the field application has not been widely studied. This research discusses the effect of heat treatment in a short time on AA7075-T651 alloy at temperatures of 300 derajat C, 400 derajat C, 500 derajat C, and 600 derajat C with the duration of each 1 hour. Alteration of microstructure were observed using scanning electron microscope and energy dispersive X-ray spectroscopy (SEM-EDS). Changes in hardness were observed through Vickers hardness test. Corrosion properties were examined by polarization methods including open-circuit potential (OCP), electrochemical impedance spectroscopy (EIS), and

potentiodynamic polarization; and the weight loss method. The microstructure alteration as a result of heat treatment influenced the hardness and corrosion behaviour. The Mg-rich phase is stable after being heated at 300 derajat C and 400 derajat C then partially dissolved and lost at 500 derajat C and 600 derajat C. The Fe-rich phase remained stable after heat treatment. The hardness of the alloy after being heated decreased from 136 HV to 78.5 HV which was influenced by changes in the distribution of precipitate and particle density from 18.0 x 104 particles/mm2 to down to 5.8 x 104 particles/mm2. Increasing particle density causes an increase in hardness and electrical conductivity but the hardness decreased after heat treatment due to the dissolution of metastable precipitates. Decreasing particle density triggers a decrease in hardness and electrical conductivity. The highest electrical conductivity of 418 x 106 (Ω.m) -1 was obtained after heating at 500 derajat C while the lowest value was obtained after heating at a temperature of 600 derajat C which was 4.22 x 106 (Ω.m) -1. The highest corrosion rate obtained after heat treatment at 300 derajat C is 45.12 mmpy followed by the morphology of corrosion in the form of exfoliation corrosion. The lowest corrosion rate obtained after heating at 600 derajatC was followed by the morphology of microgalvanic corrosion which attacked the matrix around the grain boundaries.