Pengaruh Equal Channel Angular Pressing (ECAP) terhadap struktur mikro dan sifat mekanik paduan Al-Mg = The influence of Equal Channel Angular Pressing (ECAP) on the microstructure and mechanical properties of Al-Mg alloys / I Nyoman Gede Putrayasa A

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Abstrak

ABSTRAK
Equal Channel Angular Pressing (ECAP) banyak mendapat perhatian untuk pengembangan material struktur ultra fine grain. Tujuan penelitian ini adalah mempelajari pengaruh ECAP terhadap struktur mikro dan peningkatan sifat mekanik paduan Al-Mg. Pada penelitian ini die ECAP yang digunakan memiliki sudut rongga Φ=120o dan Ψ=7 o. Pengaruh rute deformasi ECAP (A, Ba, Bc, C), jumlah pass ECAP dan perlakuan annealing setelah ECAP akan di evaluasi terhadap struktur mikro dan sifat mekanik yang dihasilkan. Pengujian yang dilakukan adalah metalografi, SEM, XRD, uji keras dan uji tarik. Hasil percobaan menunjukkan bahwa dari keempat rute ECAP, rute Bc merupakan rute deformasi yang menghasilkan butiran yang relatif bulat. Hasil uji SEM menunjukkan bahwa ECAP memperkecil ukuran presipitat dan presipitat semakin mengecil seiring dengan penambahan jumlah pass ECAP. ECAP meningkatkan sifat mekanik paduan Al-Mg dan sifat mekanik semakin meningkat dengan meningkatnya jumlah pass ECAP. Annealing pada 100 dan 200ºC setelah ECAP hanya sedikit menurunkan sifat mekanik Al-Mg, tetapi cukup menaikkan elongasi. Sedangkan pada annealing 300 ºC terjadi penurunan sifat mekanik yang signifikan. Proses annealing pada 100 ºC relatif belum merubah ukuran kristalit (sub butiran), akan tetapi dengan naiknya suhu annealing (200 dan 300 ºC) ukuran kristalit semakin membesar.
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ABSTRACT
Equal Channel Angular Pressing (ECAP) has received a lot of attention to the development of ultra fine grain structure material. The purpose of this research is to study the effect of ECAP on the microstructure and mechanical properties of Al-Mg alloys. In this study ECAP die having a cavity corner Φ=120o and Ψ=7 o was used. The influence of ECAP deformation route (A, Ba, Bc, C), the number of ECAP pass and annealing treatment after ECAP will be evaluated on the microstructure and mechanical properties produced . The testing was carried out by metallographic, SEM, XRD, hardness test and tensile test. The experimental results showed that among the four routes of ECAP, Bc route was a deformation route that produced relatively equi-axe grains. SEM test result showed that the ECAP reduced the size of precipitates and the precipitates become smaller with the increasing number of ECAP pass. ECAP increased the mechanical properties of Al-Mg alloys and the mechanical properties increased with the increasing number of ECAP pass. Annealing at 100 and 200 º C after ECAP decreased slightly the mechanical properties, but enough to increase elongation. Whereas, annealing at 300 º C decreased significantly the mechanical properties. Annealing at 100 º C had not change the crystallite size (sub-grain), but with increasing annealing temperature (200 and 300 º C) the crystallite sizes became larger.