Studi pengaruh canai dingin dan temperatur anil terhadap sekristalisasi serta sifat mekanik paduan Al-4.7Zn-1.8mg (% berat) hasil squeeze casting = Effect of cold rolling and annealing temperatur on recrystallization and mechanical properties of Al-4.7Zn-1.8mg (wt. %) produced by squeeze casting

Rachman Kurnia, author

Abstrak

Aluminium dan paduannya tengah dikembangkan sebagai badan pesawat terbang karena sifatnya yang lebih ringan daripada baja dan mudah dibentuk. Paduan aluminium 7XXX yang mengandung Zn dan Mg dapat ditingkatkan sifat mekanisnya melalui proses deformasi. Persentase deformasi yang diberikan akan meningkatkan kekerasan paduan melalui mekanisme penguatan regang. Proses anil yang dilakukan setelah deformasi akan mengembalikan keuletan paduan melalui mekanisme stress relieve, rekristalisasi dan pertumbuhan butir. Penelitian ini bertujuan untuk mengetahui pengaruh persen deformasi dan temperatur anil terhadap rekristalisasi dan sifat mekanik paduan Al-4.7Zn-1.8Mg berat.
Pembuatan paduan dilakukan dengan proses squeeze casting. Proses homogenisasi dilakukan pada temperatur 400 oC selama 4 jam. Paduan hasil homogenisasi kemudian diberikan canai dingin dengan persen deformasi 5, 10 dan 20 . Selanjutnya paduan dengan deformasi 20 diberi perlakuan panas anil dengan temperatur 300, 400 dan 500 oC selama 2 jam. Karakterisasi meliputi pengujian kekerasan untuk melihat pengaruh canai dingin dan temperatur anil terhadap sifat mekanik paduan, pengamatan struktur mikro dengan mikroskop optik dan Scanning Electron Microscope SEM yang dilengkapi dengan Energy Dispersive Spectroscopy EDS.
Hasil penelitian menunjukkan bahwa peningkatan persen deformasi sebesar menyebabkan terjadinya pemipihan butir. Deformasi 5, 10 dan 20 menghasilkan rasio deformasi butir sebesar 2.19, 3.19 and 4.59 dan meningkatkan kerasan paduan dari 69.5 HV menjadi sebesar 95.3, 100.1 dan 105.4 HV. Perlakuan panas anil pada temperatur 300 oC menyebabkan terjadinya recovery sedangkan rekristalisasi terjadi pada temperatur 400 oC dgrain 290 ?m. Grain growth terjadi pada temperatur 500 oC dgrain 434 ?m yang menyebabkan penurunan kekerasand dari 105.4 HV menjadi 71.5, 96.8 and 95.3 HV berturut turut. Rekristalisasi sempurna diprediksi pada temperature anil 375 ndash; 425 oC selama 2 jam.
<hr><i>Aluminium alloys are developed as airplane body due to its lighter weight compared to steel and good formability. Aluminium 7XXX series with Zn and Mg alloying elements are commonly used because of its mechanical properties can be improved through deformation process. Deformation such as cold rolling may increase the hardness of an alloy through strain hardening. Annealing process after deformation process will recover ductility through stress relieve, recrystallization and grain growth mechanisms. This research aimed to find out the effect of cold rolling and annealing temperatur on the recrystallization and mechanical properties of Al 4.7Zn 1.8Mg wt. alloy.
The alloy was produced by squeeze casting process. Homogenization was conducted at 400 oC for 4 hours followed by cold rolling with degree of deformation of 5, 10 and 20 . The samples with 20 of deformation were then annealed at 300, 400 and 500 oC for 2 h. Vickers hardness test was performed on the cold rolled and annealed samples to reveal strain hardening effect and subsequent recrystallization process.

Microstructure was observed by using optical microscope and Scanning Electron Microscope SEM with Energy Dispersive Spectroscopy EDS.
The results showed that the higher the deformation, the more elongated the grains. Deformation of 5, 10 and 20 led to grain shape ratios of 2.19, 3.19 and 4.59, respectively and increase in the hardness of the alloy from 69.5 HV to 95.3, 100.1 and 105.4 HV, respectively. Annealing at 300 oC resulted in recovery, while at 400 oC, recrystallization occured dgrain 290 m. Grain growth was observed after annealing at 500 oC for 2 h dgrain 434 m. The annealing temperature of 300, 400 and 500 oC decrease the hardness of the alloy from 105.4 HV to 71.5, 96.8 and 95.3 HV, respectively. Full recrystallization was predicted to happen at 375 ndash 425 oC for 2 hours.</i>