Studi Pengaruh Temperatur Laku Pelarutan terhadap Struktur Mikro dan Sifat Mekanis Paduan Al-4.4Zn-1.6Mg-0.4Ti (% berat) Hasil Squeeze Casting = Effect of Solution Treatment Temperatures on Microstructure and Mechanical Properties of Al-4.4Zn-1.6Mg-0.4Ti alloy (wt.%) Fabricated by Squeeze Casting

Elisabeth Nadya Hale, author

Abstrak

Paduan Al-Zn-Mg (Seri 7xxx) umumnya diperkuat melalui perlakuan penuaan, dengan pembentukan presipitat. Selain itu, paduan dapat diperkuat pula dengan penambahan 0.4 % berat Ti yang akan memperhalus butir. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh Ti dalam penguatan presipitasi paduan Al-4.4Zn-1.6Mg-0.4Ti (% berat) pada berbagai temperatur. Paduan ini diproses melalui pengecoran dengan proses squeeze casting, homogenisasi pada temperatur 400 oC selama 4 jam, laku pelarutan dengan variasi temperatur 220, 420, dan 490 oC selama 1 jam, pencelupan air, lalu dilakukan penuaan pada temperatur 130 °C selama 48 jam. Karakterisasi yang dilakukan berupa pengamatan struktur mikro menggunakan mikroskop optik, dan Scanning Electron Microscope (SEM) – Energy Dispersive Spectroscopy (EDS), pengujian kekerasan Rockwell, X-Ray Diffraction (XRD), dan Differential Scanning Calorimetry (DSC). Penambahan 0.4 % berat Ti selain memperhalus dan membulatkan butir, menurunkan tegangan permukaan antarmuka matriks dan fasa kedua, dan pelarutan fasa kedua menjadi lebih mudah. Banyaknya fasa kedua yang larut berpengaruh dengan kekerasan setelah laku pelarutan dan penuaan. Kekerasan akhir setelah penuaan dengan laku pelarutan 220, 420, dan 490 oC sebesar 38.26, 63.76, dan 63.36 HRB. Nilai kekerasan tersebut lebih tinggi daripada paduan tanpa Ti karena pelarutan fasa kedua yang lebih banyak menyebabkan pembentukan presispitat yang lebih banyak pula.....Al-Zn-Mg alloys (7xxx series Al alloys) are commmonly hardened with ageing treatment, to form precipitates. To further increase the strength, Ti is added to decrease the grain size. The objective of this study is to investigate the role of Ti in the precipitation strengthening of Al-4.4Zn-1.6Mg-0.4Ti (wt.%) alloy. The alloy was fabricated by squeeze casting process. Then, the alloy was homogenized at 400 oC for 4 hours, solution treated at 220, 420, and 490 oC for 1 h followed by water quenching, then aged at 130 oC for 48 h. Characterization was performed by optical microscope, Scanning Electron Microscope (SEM) – Energy Dispersive Spectroscopy (EDS), Rockwell hardness testing, X-Ray Diffraction (XRD), and Differential Scanning Calorimetry (DSC). The addition of 0.4 wt. % Ti resulted finer and rounder grains which possess lower surface tension between the -Al matrix and second phase interface to dissolves second phases easier during solution treatment. The amount of dissolved second phases will affect the final hardness after ageing to 38.26, 63.76, and 63.36 HRB with solution treatment temperature of 220, 420, and 490 °C, respectively. Besides, the hardness value of 0.4 wt. % Ti added alloy was higher than that of the alloy without Ti addition. It was due to higher second phase dissolution which leads to more precipitates formed.