

ABSTRAK

Aluminium merupakan salah satu logam yang sering digunakan untuk bahan baku mesin, alat elektronik dan instrument lainnya, aluminium digunakan karena memiliki beberapa keunggulan yakni tahan korosi, ringan dan mudah dibentuk. Namun disamping keunggulan tersebut aluminium termasuk logam yang lunak, sehingga perlu diperbaiki sifat mekaniknya. Untuk memperbaiki sifat mekanik tersebut bisa digunakan dengan cara pencampuran dengan unsur lain dan proses *heat treatment*. Pada penelitian sebelumnya telah dilakukan proses *heat treatment* dan disebutkan bahwa proses *double stage aging* mendapatkan nilai kekerasan tertinggi, namun tidak dijelaskan bagaimana pengaruh variasi suhu terhadap paduan tersebut. Dalam penelitian ini digunakan proses *heat treatment* berupa *double stage aging* dengan variasi temperatur yang bertujuan untuk menganalisis pengaruh variasi temperatur terhadap struktur mikro menggunakan metalografi dan menentukan korelasi pengaruh variasi temperatur pada proses *double stage aging* dengan kekerasan paduan Al-Si-Cu-Fe. Proses *heat treatment* berupa *double stage aging* diawali dengan proses *solid solution treatment* pada suhu 540 °C selama lima jam dan *quenching water* pada suhu 60 °C selama 10 menit, selanjutnya dilakukan proses *single stage aging* pada temperatur 155 °C dengan waktu penahanan selama dua jam setelah itu dilakukan kembali pemanasan tahap kedua *double stage aging* menggunakan temperatur 170 °C, 180 °C dan 190 °C. Pada mengamatan metalografi setelah proses *heat treatment* adanya fasa α -Al, AlSi, AlSiFe dan didapatkan perubahan struktur fasa yang terlihat pada ukuran butir fasa semakin kecil hal ini berdampak pada nilai kekerasan yang semakin baik, nilai kekerasan tertinggi ada di sampel DSA 190 °C sebesar 76,9 kgf/mm² dengan peningkatan kekerasan sebesar 39% pada sampel setelah dilakukan *heat treatment*.

Kata kunci: paduan aluminium, *double stage aging*, perubahan struktur fasa.

ABSTRACT

Aluminum is one of the metals that is often used as raw material for machines, electronic devices and other instruments, aluminum is used because it has several advantages, namely corrosion resistance, light weight and easy to form. However, besides these advantages, aluminum is a soft metal, so its mechanical properties need to be improved. To improve the mechanical properties can be used by mixing with other elements and heat treatment process. In previous research, the heat treatment process was carried out and it was stated that the double stage aging process obtained the highest hardness value, but it was not explained how the effect of temperature variations on the alloy. In this research, a heat treatment process was used in the form of double stage aging with temperature variations which aims to analyze the effect of temperature variations on the microstructure using metallography and determine the correlation of the effect of temperature variations on the double stage aging process with Al-Si-Cu-Fe alloy hardness. The heat treatment process in the form of double stage aging begins with a solid solution treatment process at 540 °C for five hours and quenching water at 60 °C for 10 minutes, then a single stage aging process is carried out at a temperature of 155 °C with a holding time of two hours. After that, the second stage of double aging was carried out again using temperatures of 170 °C, 180 °C and 190 °C. In metallographic observation after the heat treatment process there are α -Al, AlSiAlSiFe phases and obtained changes in the phase structure seen in the smaller phase grain size this has an impact on the better hardness value, the highest hardness value is in the 190 °C DSA sample of 76.9 kgf/mm² with an increase in hardness of 39% in the sample after heat treatment.

Keywords: *Aluminum alloy, double stage aging, phase structure changes.*