Pengaruh Metode Pencelupan Terhadap Transformasi Fasa dan Kekerasan Cu-26,5-3,7Mn (%Atomik) untuk Aplikasi Paduan Ingat Bentuk = The Effect of Quenching Methods on Phase Transformation and Hardness of Cu-26.5Al-3.7Mn (at. %) for Shape Memory Application

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Abstrak

Paduan ingat bentuk merupakan salah satu material cerdas yang memiliki karakteristik unik dimana paduan ini dapat mengingat bentuk saat diberi panas. Paduan ingat bentuk yang berbasis Cu merupakan alternatif yang paling baik dikarenakan harganya yang murah dan memiliki sifat ingat bentuk yang baik. Penelitian ini mempelajari pengaruh metode pencelupan terhadap transformasi fasa dan kekerasan paduan Cu-26.5Al-3.7Mn (%Atomik) yang difabrikasi menggunakan metode pengecoran gravitasi. Paduan dihomogenisasi pada temperatur 900 ? selama 2 jam. Selanjutnya dilakukan perlakuan panas betatizing pada temperatur 900 ? selama 30 menit dan dilanjutkan dengan tiga metode pencelupan yang berbeda, yaitu Pencelupan Langsung (DQ), Pencelupan Naik (UQ), dan Pencelupan Bertahap (SQ). Karakterisasi menggunakan Optical Microscope (OM), Scanning Electron Microscopy dan Energy Dispersive X-Ray Spectroscopy (SEM-EDX), Optical Emission Spectroscopy (OES), X-Ray Diffraction (XRD), Differential Scanning Calorimetry (DSC), Microvickers, dan uji pemulihan regangan. Hasil penelitian menunjukkan bahwa struktur mikro paduan pada kondisi As-Cast dan As-Homogenized terdiri dari dua fasa yaitu ? [D03] dan ? dengan morfologi rosette-like. Pencelupan DQ dan UQ menghasilkan martensit ?' dan ? [D03] sisa, sementara pencelupan SQ selain menghasilkan fasa tersebut juga terdapat ?. Selanjutnya, nilai kekerasan adalah 288,71 HVN (As-cast), 300,21 HVN (As-Homogenized), 232,2 HVN (DQ), 240,1 HVN (UQ), dan 289 HVN (SQ). Persentase pemulihan regangan tidak dapat diukur dikarenakan sampel patah saat ditekuk. .....The shape memory alloy is a smart material with unique characteristics where it can remember its shape when subjected to heat. Cu-based shape memory alloys are considered the most favorable alternative due to their low cost and good shape memory properties. In this study, the influence of quenching methods on phase transformation and hardness of Cu-26.5Al-3.7Mn (at. %) alloy fabricated using gravity casting method was investigated. The alloy was homogenized at 900 ? for 2 hours, and then betatized at 900 ? for 30 minutes, followed by three different quenching methods: Direct Quenching (DQ), Up Quenching (UQ), and Step Quenching (SQ). The alloy was then characterized using Optical Microscope (OM), Scanning Electron Microscopy and Energy Dispersive X-Ray Spectroscopy (SEM-EDX), Optical Emission Spectroscopy (OES), X-Ray Diffraction (XRD), Differential Scanning Calorimetry (DSC), Microvickers, and Strain Recovery test. The results of this study showed that the microstructure of the as-cast and as-homogenized alloy consisted of two phases, ? [D03] and ?, with a rosette-like morphology. DQ and UQ quenching methods resulted in the formation of ? [D03] and ?' phases, meanwhile, the SQ quenching method not only resulted in the mentioned phase but also the ? phase. Furthermore, the hardness values were 288.71 VHN (As-Cast), 300.21 VHN (As-Homogenized), 232.2 VHN (DQ), 240.1 VHN (UQ), and 289 VHN (SQ), respectively. The percentage of strain recovery could not be measured as the samples experienced failure when bent.