Pengaruh Metode Pencelupan terhadap Karakteristik Fasa Martensit dan Pemulihan Regangan pada Paduan Ingat Bentuk Cu-28Zn-3.5Al = Effects of Quenching Methods on the Characteristics of Martensite Phase and Strain Recovery of Cu-28Zn-3.5Al Shape Memory Alloy.

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Abstrak

ABSTRACT
Paduan memori bentuk berbasis tembaga adalah bahan alternatif untuk menggantikan paduan Ni-Ti komersial karena paduannya ekonomis dan mudah dibuat. Penggunaan paduan memori bentuk berbasis tembaga seperti paduan terner Cu-Zn-Al biasanya memiliki beberapa kendala seperti stabilisasi fase yang dapat dihindari dengan menggunakan metode pendinginan alternatif. Oleh karena itu, penelitian ini mempelajari efek metode pendinginan pada karakteristik martensit dan pemulihan regangan paduan Cu-28Zn-3.5Al (wt.%). Plat as-cast dihomogenisasi pada 850 oC selama 2 jam sebelum larutan diperlakukan pada 850 oC selama 30 menit diikuti dengan pendinginan menggunakan direct quench (DQ), up quench (UQ) dan metode step quench (SQ). Karakterisasi pada paduan dilakukan dengan menggunakan uji komposisi OES, pengamatan struktural menggunakan mikroskop optik dan SEM, analisis mikro EDS, uji XRD, uji kekerasan, uji DSC, dan uji tekuk untuk mengamati pemulihan regangan. As - cast dan as - homogenisasi terdiri dari α [A1] dan β [D03] fase biner dengan α [A1]: β [D03] rasio 46:54, bersama dengan kekerasan fase α [A1] dari 106.73 HV dan β [D03] kekerasan fase 195,82 HV. Perlakuan panas langsung (DQ) dan naik (UQ) menghasilkan β ′ [M18R] dengan jarak interlamelar 9,08 dan 6,08, masing-masing, sedangkan pendinginan langkah menghasilkan fasa β [D03] dan α [A1] dengan β [D03]: α [A1] dari 94: 6. Kekerasan paduan pada pendinginan langsung, pendinginan naik dan pendinginan adalah 175,46 HV, 186,90 HV, dan 195,49 HV. Sedangkan regangan pemulihan quench langsung, quench dan step quench adalah 52,76, 58,4 dan 5,86%. Up quench memiliki suhu transformasi austenit dan martensit yang selesai dalam periode yang lebih pendek daripada pendinginan langsung yang karenanya mengakomodasi sifat memori bentuk yang lebih baik.
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ABSTRACT
Copper-based form memory alloys are an alternative material to replace commercial Ni-Ti alloys because they are economical and easy to make. The use of copper-based form memory alloys such as the Cu-Zn-Al ternary alloy usually has several constraints such as phase stabilization which can be avoided by using alternative cooling methods. Therefore, this study studies the effects of the cooling method on the characteristics of martensite and strain recovery of Cu-28Zn-3.5Al alloys (wt.%). As-cast plates were homogenized at 850 oC for 2 hours before the solution was treated at 850 oC for 30 minutes followed by cooling using direct quench (DQ), up quench (UQ) and step quench (SQ) methods. Characterization of the alloy was carried out using the OES composition test, structural observations using optical microscopy and SEM, EDS micro analysis, XRD test, hardness test, DSC test, and buckling test to observe strain recovery. As-cast and as-homogenization consist of α [A1] and β [D03] binary phase with α [A1]: β [D03] ratio of 46:54, along with α [A1] phase hardness of 106.73 HV and β [D03]

195.82 HV phase hardness. Direct heat treatment (DQ) and rise (UQ) produce β ′ [M18R] with interlamatic distances of 9.08 and 6.08, respectively, whereas cooling steps produce phases β [D03] and α [A1] to β [D03]]: α [A1] of 94: 6. Hardness of the alloy in direct cooling, rising cooling and cooling is 175.46 HV, 186.90 HV, and 195.49 HV. While the direct recovery quench strain, quench and step quench are 52.76, 58.4 and 5.86%. Up quench has austenitic and martensitic transformation temperatures that are completed in a shorter period than direct cooling which therefore accommodates better shape memory properties.