Pengaruh canai dingin dan temperatur anil terhadap karakteristik fasa dan paduan Cu-29.5Zn-2.5al hasil pengecoran gravitasi = Effect of cold rolling and annealing temperature to the characteristics of + phases in Cu29.5Zn-2.5al alloy produced by gravity casting

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Abstrak

Optimalisasi paduan cartridge brass sebelumnya telah dilakukan lewat penambahan paduan Al, menghasilkan paduan Al-brass dengan fasa dan biner yang memiliki kekuatan mekanis lebih tinggi dari paduan konvensional tanpa mengalami reduksi elongasi yang signifikan. Dalam penelitian ini, dipelajari mengenai pengaruh proses manufaktur canai dingin dan perlakuan anil terhadap karakteristik fasa dan yang terdapat dalam paduan Cu-29.5Zn-2.5Al wt. hasil pengecoran gravitasi. Pelat as-cast dihomogenisasi pada temperatur 800 °C selama 2 jam, dideformasi menggunakan canai dingin dengan derajat deformasi sebesar 20, 40, dan 50, dan diberikan perlakuan anil pada temperatur 150, 300, 400, dan 600 °C selama 30 menit. Karakterisasi dilakukan melalui observasi mikrostruktur dengan mikroskop optik, pengambilan gambar dengan SEM, uji komposisi OES dan SEM-EDS, karakterisasi fasa dengan XRD, dan pengujian kekerasan mikro dengan metode Vickers. Paduan as-homogenized memiliki struktur mikro martensitik dua fasa dan dan dengan diamond-shape configuration. Setelah canai dingin terlihat adanya mekanisme deformasi slip, cross-slip, twinning, dan pembentukan shear band hanya pada fasa ?, sementara peningkatan kekerasan mikro terjadi pada kedua fasa dan. Selanjutnya, perlakuan anil temperatur rendah pada 150 °C menghasilkan peningkatan kekerasan mikro paduan akibat pembentukan atmosfir Cottrel, sementara perlakuan anil di temperatur 300, 400, dan 600 °C menghasilkan penurunan nilai kekerasan mikro akibat mekanisme penguraian dislokasi dan relaksasi tegangan. Rekristalisasi butir equiaxed hanya terjadi di fasa dan pada hasil anil temperatur 600 °C.

<hr>Previous research displayed a successful attempt in optimizing mechanical properties of cartridge brass by utilizing Al alloying element, producing binary Al brass alloy with higher strength and hardness without a significant diminution in its elongation compared to conventional cartridge brass alloys. Hereinafter, the effect of cold rolling and annealing treatment on the characteristics of and phases in gravity casted Cu 29.5Zn 2.5Al wt. alloy was studied. Produced as cast samples were homogenized at 800 °C for 2 h, subjected to cold rolling with 20, 40, and 50 reduction in thickness, and annealed at 150, 300, 400, and 600 °C for 30 min. Phase characterizations were done through optical microscopy, SEM imaging, OES and SEM EDS composition analysis, XRD, and micro Vickers hardness measurement. A binary martensitic morphology with diamond shape configuration compromising of and phases were found in as homogenized sample. Cold rolling resulted in slip, cross slip, twinning, and formation of shear band, solely in the phase. However, increase in microhardness was detected in both and phases. Furthermore, it was found that low temperature annealing at 150 °C resulted in an increase of micro hardness of both phases due to the formation of Cottrel atmosphere, while usual decrease in hardness value was discovered after annealing at 300, 400, and 600 °C through disl°Cation entanglement and stress recovery mechanisms. Recrystallized phase grains in equiaxed shape were visible in sample annealed at 600 °C.