Pengaruh Penambahan 1, 3, 5 wt.% Cu terhadap karakteristik Sudu Turbin Radial Inflow paduan Al-9Zn-4Mg hasil investment casting = Effects of 1, 3, 5 wt.% Cu addition on characteristics of Al-9Zn-4Mg alloy for radial Inflow Turbine Blade produced by investment casting results

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Abstrak

Aluminium telah memberikan peranan penting dalam dunia manufaktur karena sifatnya yang ringan dan tahan korosi. Akan tetapi, aluminium perlu ditingkatkan kekuatan mekanisnya dengan cara menambahkan paduan lain seperti Zn, Mg, Cu dll. Penggunaan material ringan seperti AlZnMgCu sangat efektif dalam meningkatkan efisiensi pembangkit listrik sistem Organic Rankine Cycle (ORC) yang diaplikasikan pada temperatur rendah (90-160oC). Turbin radial inflow biasanya diproduksi dengan permesinan namun biaya yang dibutuhkan cukup tinggi karena waktu yang lama dan banyaknya material yang terbuang. Proses permesinan dapat digantikan dengan teknologi investment casting yang dapat memproduksi produk yang presisi dan bentuk yang rumit seperti sudu turbin.
Studi ini mempelajari pengaruh penambahan Cu sebesar 1, 3 dan 5 wt.% dalam paduan Al- 9Zn-4Mg pada sudu turbin radial inflow hasil investment casting. Karakterisasi meliputi pemeriksaan visual, uji kekerasan di beberapa titik dan pengamatan struktur mikro. Struktur mikro diamati menggunakan mikroskop optik dan SEM (scanning electron microscope) yang dilengkapi dengan EDS (energy dispersive spectroscopy). Hasil pemeriksaan visual menunjukkan tidak ditemukan cacat macroporosity, retak, misrun dan shrinkage serta permukaan hasil coran yang halus. Pengujian kekerasan dilakukan untuk mengamati sifat mekanis paduan. Penambahan Cu meningkatkan nilai kekerasan secara signifikan karena terbentuk fasa, CuMgAl2, CuAl2, MgZn2 dan Mg3Zn3Al2.
.....Aluminium has an important role in manufactury industry because of its light-weight and high corrosion ressitant. However, the mechanical properties of aluminium needs to be improved by adding other alloying element such as Zn, Mg, Cu. The use of light materials like AlZnMgCu is effective to improve the efficiency of Organic Rankine Cycle (ORC) power plant system which is applied at low temperature (90-160 oC). Radial inflow turbine blade is generally produced by machining, but the cost is very high because of its long production time and waste. Machining process can be replaced by investment casting which can produce precision and complicated-shape products such as turbine blade.
This research studies the effect of Cu addition of 1, 3 and 5 wt.% in Al-9Zn-4Mg alloy for radial inflow turbine blade produced by investment casting. A series of testing was conducted such as : hardness and microstructural observation by optical microscope and SEM (scanning electron microscopy) which was combined with EDS (energy dispersive spectroscopy). The visual examination result showed that there was no macroporosity defect, crack, misrun, and shrinkage. In addition, the surface of casting product was enough smooth. Hardness test was done to observe the mechanical characteristics of alloys. Cu addition improves hardness value significantly because it created CuMgAl2, CuAl2, MgZn2 and Mg3Zn3Al2 phase.