Pembuatan ingot standar paduan aluminium bs 1490 seri lm 4 dan lm 13 dari bahan baku skrap

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Abstrak

Simulasi pencampuran bahan-baku skrap aluminium yang berbeda, peramuan dan pemaduan serta peleburan diharapkan akan menghasilkan ingot yang sesuai atau mendekati standar aluminium coran. Pemanfaatan bahan-baku skrap mampu menampung bahan buangan yang menoemari lingkungan menjadi berguna. Telah dibuat ingot standar paduan aluminium coran BS 1490 seri LM4 dan LM13 dengan menggunakan bahan-baku skrap. Skrap aluminium yang digunakan diambil dari ind ustri kecil menengah pengecoran Iogam bukan besi di daerah Pasuruan Jawa Timur, terdiri dari skrap piston, kawat, plat, hanger Iistrik, roda gigi, blok mesin dan lain-lain. Pada peneiitian ini, bahan-baku skrap dipisahkan berdasarkan jenisnya, kemudian dianalisa komposisi kimianya dengan menggunakan Spektrometer. Perhitungan peramuan dan pemaduan secara komputerisasi dilakukan sebelum peleburan. Penambahan unsur-unsur paduan pada saat peleburan dilakukan agar komposisi target tercapai. Peleburan dilakukan dalam tungku krusibel dengan bahan-bakar kokas sampai temperatur 720°C. Logam cair hasil peleburan dituangkan kedalam masing-masing cetakan pasir dan cetakan Iogam yang telah disiapkan. Spesimen hasil peleburan kemudian dilakukan pengujlan mekanis berupa uji tarik dan uji kekerasan, juga dilakukan pengujian metalograti dengan mikroskop optik. Pembuatan ingot standar LM4 dan LM13 dengan bahan baku skrap telah berhasil dilakukan sesuai dengan komposisi standar yang dipersyaratkan. Kekuatan mekanis dan struktur mikro ingot dengan cetakan Iogam jauh lebih baik dibandlngkan dengan cetakan pasir. Porositas mempengaruhi kekuatan mekanis, ingot cetakan pasir dengan porositas yang tinggi menghasilkan kekuatan yang lebih rendah dari ingot cetakan Iogam dengan porositas rendah. Metode pengecoran dengan cetakan Iogam menghasilkan ingot dengan kekuatan mekanis meningkat rata-rata sebesar 30% dibandingkan metode pengecoran cetakan pasir. Dari struktur mikro ingot standar terbentuk fasa-fasa a (AI) dan eutectic yang telah sesuai dengan diagram fasa paduan biner AlSi. Peleburan ulang pada ingot menyebabkan pengurangan kandungan silikon sebanyak 30-40%.

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 Abstract

Mixing simulation between differences feedstock of aluminium scraps, formulation, combination and then melting process were examined to obtain ingot, which has quality similar to that of aluminium casting standard. The utilization of scrap as a feedstock can minimize environmental problem and also obtain benefit

value for waste products. The standard ingot from aluminium alloy BS 1490-LM4 and LM13 have made using scraps feedstock, which derived from waste products. Aluminium scraps, which contained piston scrap, wire, plate, electrical arch, gear, and machine block, were obtained from small size industries of metal non-iron processing at Pasuruan, East Java.

ln this study, scrap feedstock were separated according to their types. Then, their chemical composition were analysed using spectrometer. Computerize calculation for formulation and fusion were carried out before melting process. Additional matters of fusion were conducted as melting process occurs to obtain a target composition. Melting was carried out in the crucible muffle using cokes as fuels at temperature of 72O°C. Liquid metal product was poured onto sand and metal moulds. Afterwards, these product were tested in order to find their mechanic strength and stiffness. Nletalographic analyses on these products were also carried out using optical microscope.

The making of ingot standard LM4 and LM13 were successfully obtained in fulfilling the standard composition. The mechanic strength and micro-structure of ingot, produced from metal mould, has shown good performance than that of produced from sand mould. This examination shown that the porosity affected mechanic strength. ingot sand mould, which has high porosity, gave less strength compared to that of ingot metal mould, which has small porosity.

The casting methode using metal mould produced ingot with increasing in mechanic strength by 30% compared to that of methode using sand mould. It was also found that or (Al) and eutectic phases were formed from micro-structure of standard ingot, which shown similar to that phase diagram binary fusion AlSi. It was also evidence that ingot remelting caused reduction in silicon concentration by 30-40%