

## INTISARI

*Remelting* adalah proses pengecoran dengan memanfaatkan bahan bekas (sekrap) ataupun *reject materials* dari peleburan sebelumnya yang banyak terdapat di industri kecil. Penelitian ini dimaksudkan untuk mengetahui pengaruh *remelting* terhadap sifat fisis, mekanis, ketangguhan dan laju perambatan retak paduan aluminium.

Bahan yang digunakan adalah sekrap aluminium terpilih. Bahan dilebur dan dituang dengan suhu 724°C dengan cetakan logam, kemudian dibuat spesimen standar ASTM E.8 untuk pengujian tarik, ASTM E.23 untuk pengujian impak, ASTM.E 399 untuk ketangguhan dan ASTM E.647 untuk laju perambatan retak. *Remelting* dilakukan sampai 3 kali dengan kondisi penuangan yang sama. Pengujian ketangguhan dengan menggunakan 5 variasi ketebalan dan pengujian laju perambatan retak dilakukan pada kondisi suhu ruang dengan amplitudo beban konstan dan perbandingan beban ( $R$ )= 0,1; 0,3 dan 0,6

Dari analisis data menunjukkan bahwa *remelting* mengakibatkan terjadinya perubahan sifat fisis paduan aluminium yang ditandai dengan bertambahnya porositas pada struktur mikronya tetapi relatif tidak mengubah komposisi kimia. *Remelting* mempengaruhi sifat mekanis paduan aluminium, yaitu terdapat penurunan kekerasan (*remelting* I= 57,5314 HBN; II=57,1794 HBN, dan III= 55,8066 HBN), penurunan kekuatan tarik (*remelting* I= 161,141 MPa, II= 147,587 MPa, dan III= 146,257 MPa), penurunan ketangguhan impak (*remelting* I=1,70 Joule, II=1,33 Joule, dan III= 1,2 Joule). *Remelting* dapat menurunkan ketangguhan paduan aluminium (*remelting* I=3,9549 MPa.m<sup>0.5</sup>, II= 3,5749 MPa.m<sup>0.5</sup> dan III=3,5488 MPa.m<sup>0.5</sup>). Ketebalan spesimen kondisi *plane strain* pada pengujian  $K_{IC}$  lebih awal dicapai pada bahan yang lebih getas. *Remelting* juga dapat mempercepat laju perambatan retak yang ditunjukkan dengan kenaikan harga eksponensial  $n$ . Pada kondisi retak yang sama, laju perambatan retak meningkat bila perbandingan beban ( $R$ ) dinaikkan.

Kata kunci : *Remelting*, sifat fisis, sifat mekanis, ketangguhan dan laju perambatan retak

## ABSTRACT

The remelting is the casting process by using scrap of materials or reject materials from previous melting at the small scale industries. The purpose of this research is to observe the effect of remelting on physical, mechanical properties, fracture toughness and fatigue crack growth rates of the aluminum alloys.

The material with was used were scrap aluminum selected. The material was melt and cast at temperature 724°C in the metal molding, then was made standard specimen ASTM E.8 for the tensile testing, ASTM E.23 for the impact testing, ASTM E. 399 for the fracture toughness testing and ASTM E.647 for fatigue crack growth rates testing. The remelting was done in three times at the same condition. The fracture toughness testing was used five variation of thickness and the fatigue crack growth rate testing was performed in a room temperature condition with a constant load amplitude and the load ratio was maintained to be 0,1; 0,3 and 0,6.

From the data analyses show that remelting can causes change of physical properties with was shown by increase of porosities in the aluminum micro structure but the chemical composition was not become different relatively. The remelting was had influence on mechanical properties of the aluminum alloys, i.e. decrease of hardness (1<sup>st</sup> remelting was 57,5314 HBN; 2<sup>nd</sup> was 57,1794 HBN, and 3<sup>d</sup> was 55,8066 HBN), decrease of tensile strength (1<sup>st</sup> remelting was 161,141 MPa, 2<sup>nd</sup> was 147,587 MPa, and 3<sup>rd</sup> was 146,257 MPa) and decrease of impact (1<sup>st</sup> remelting was 1,70 Joule, 2<sup>nd</sup> was 1,33 Joule, and 3<sup>rd</sup> was 1, 2Joule).

The remelting can decrease fracture toughness of the aluminum alloys ( 1<sup>st</sup> remelting was 3,9549 MPa.m<sup>0,5</sup>, 2<sup>nd</sup> was 3,5749 MPa.m<sup>0,5</sup>, and 3<sup>rd</sup> was 3,5488 MPa.m<sup>0,5</sup>), whereas remelting can increase fatigue crack growth rates which was shown by increasing of  $n$  exponential values. The plane strain manner for specimen's thickness in the facture toughness testing was reached by more brittle materials. And at the same crack condition, fatigue crack growth rates increase if load ratio (R) was increasing.

**Keywords :** Remelting, physical properties, mechanical properties, facture toughness, fatigue crack growth rate