

Comparative Study of Fractural Work Aluminum 1xxx and 3xx.x Series with Single Edge Notched Tensile (SENT)

Abstract

Aluminum is one of the non-ferrous metals that is often used in transportation such as cars, ships and aircraft. Tensile test was carried out to investigate the mechanical properties of materials, one of which is toughness. Toughness can be determined by calculating work of fracture. The purpose of this study is to investigate the comparison between work of fracture and stress intensity factor.

The specimens used are aluminum 1xxx and 3xx.x series. The tensile test was performed using a single notch with 45° angle and ± 5 mm notch length (a). The notch was made using self-modifying files and sandpaper. The calculating method used for work of fracture was ImageJ software.

The result of the study showed that the work of fracture value (W) of the aluminum 3xx.x (308.93 kJ/m²) was higher than the aluminum 1xxx (298.96 kJ/m²). The value of the stress intensity factor (K_I) of the aluminum 3xx.x (20.02 MPa. \sqrt{m}) was higher than aluminum 1xxx (16.67 MPa. \sqrt{m}). Based on the work of fracture and stress intensity factor (K_I), it could be concluded that the aluminum 3xx.x was tougher than the aluminum 1xxx.

Keywords: *Aluminum 1xxx and 3xx.x series, the work of fracture, stress intensity factors, toughness.*

Studi Komparasi Kinerja Perpatahan Aluminium Seri 1xxx dan 3xx.x dengan *Single Edge Notched Tensile* (SENT)

Abstrak

Aluminium merupakan salah satu logam non fero yang sering digunakan pada bidang transportasi seperti mobil, kapal laut, dan pesawat terbang. Pengujian tarik dilakukan untuk mengetahui sifat mekanis material, salah satunya ketangguhan. Ketangguhan dapat diketahui dengan menghitung kinerja perpatahan. Tujuan pengujian dilakukan untuk mengetahui perbandingan kinerja perpatahan dan faktor intensitas tegangan.

Spesimen yang digunakan adalah aluminium seri 1xxx dan 3xx.x. Pengujian tarik dilakukan menggunakan takikan tunggal dengan sudut sebesar 45° dan panjang takik (a) ± 5 mm. Pembuatan takikan menggunakan kikir yang dimodifikasi sendiri dan amplas. Metode perhitungan kinerja perpatahan menggunakan aplikasi imageJ.

Hasil perhitungan menunjukkan bahwa nilai kinerja perpatahan (W) aluminium seri 3xx.x (308.93 kJ/m^2) lebih besar dibanding aluminium seri 1xxx (298.96 kJ/m^2). Kemudian nilai faktor intensitas tegangan (K_I) aluminium seri 3xx.x ($20.02 \text{ MPa}\cdot\sqrt{\text{m}}$) lebih besar dibanding aluminium seri 1xxx ($16.67 \text{ MPa}\cdot\sqrt{\text{m}}$). Berdasarkan hasil perhitungan kinerja perpatahan (W) dan faktor intensitas tegangan (K_I) dapat disimpulkan bahwa aluminium seri 3xx.x lebih tangguh dibanding aluminium seri 1xxx.

Kata kunci: Aluminium seri 1xxx dan 3xx.x, kinerja perpatahan, faktor intensitas tegangan, ketangguhan.