

ABSTRAK

PENGARUH ARAH *HOT ROLLING* TERHADAP KEKUATAN TARIK DAN PERAMBATAN RETAK FATIK TITANIUM *GRADE 2*

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Titanium *Grade 2* merupakan titanium murni yang mendapat perhatian khusus karena sifat mekaniknya yang seimbang dan ketahanan korosi yang unggul. Namun seperti logam lainnya sifat mekanik titanium dapat dipengaruhi secara signifikan oleh proses manufaktur yang diterapkan khususnya proses pembentukan *hot rolling*. Penelitian ini bertujuan untuk menyelidiki secara sistematis pengaruh arah *hot rolling* terhadap kekuatan tarik dan perambatan retak fatik titanium *grade 2* dengan arah pembebanan LT dan TL. Penelitian melibatkan pengujian tarik (ASTM E8), pengujian perambatan retak fatik (ASTM E647), pengamatan struktur mikro, dan pengamatan SEM fraktografi. Hasil menunjukkan nilai kekuatan tarik tertinggi diperoleh pada arah LT karena butir-butir yang terelongasi dan terdeformasi searah pengerolan memberikan kekuatan tarik yang lebih tinggi. Karakteristik perambatan retak fatik dengan arah pembebanan LT lebih baik dibandingkan dengan arah pembebanan TL. Spesimen pembebanan LT mendapatkan nilai konstanta eksponensial (m) sebesar 3,4566 lebih kecil dari s arah pembebanan TL yaitu sebesar 3.5117. Hasil SEM menunjukkan pola patahan LT *intergranular*, *secondary crack*, *cleavage*, dan *voids*, sedangkan pada TL ditunjukkan pola patahan LT *intergranular*, *secondary crack*, *cleavage*, *ductile* dan *voids*.

Kata kunci :Titanium *grade 2*, *Hot rolling*, Uji tarik statis, Perambatan retak fatik, *Equiaxed alfa*.

ABSTRACT

EFFECT OF HOT ROLLING DIRECTION ON TENSILE STRENGTH AND FATIGUE CRACK PROGRESSION OF TITANIUM GRADE 2

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Titanium Grade 2 is a pure titanium that has received special attention due to its balanced mechanical properties and superior corrosion resistance. However like other metals the mechanical properties of titanium can be significantly affected by the manufacturing process applied in particular the hot rolling forming process. This study aims to systematically investigate the effect of hot rolling direction on the tensile strength and fatigue crack propagation of grade 2 titanium with LT and TL loading directions. The research involved tensile testing (ASTM E8), fatigue crack propagation testing (ASTM E647), microstructure observation, and fractographic SEM observation. The results showed that the highest tensile strength values were obtained in the LT direction as the grains were elongated and deformed in the direction of rolling giving higher tensile strength. Fatigue crack propagation characteristics with LT loading direction are better than TL loading direction. The LT loading specimen obtained an exponential constant (m) value of 3.4566 which is smaller than the TL loading direction of 3.5117. SEM results showed LT intergranular, secondary crack, cleavage, and voids, while TL showed LT intergranular, secondary crack, cleavage, ductile and voids.

Keywords : *Titanium grade 2, Hot rolling, Tensile strenght test, Fatigue crack propagation, Equiaxed alpha.*