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Fatigue crack initiation and growth of aluminum alloy with stress ratio effects

Abstract

Fatigue crack initiation and growth of aluminum alloys with stress ratio were investigated due to it was widely used in aircraft production parts. Various types of aluminium alloy have been selected (6063-T6, 7075-T6, and 2024-T351). Compact design standard based on ASTM standard E647-11 was used for specimen. Cyclic loading experiment was conducted using Instron 8801 Hydraulic Server Machine with *da/dN* software for setup and parameter setting. Investigations on crack propagation and fracture surface were done by using Scanning Electron Microscope (SEM) to obtain the image of the specimen surface. Further analysis was done on the image to study on the crack initiation and propagation. Various stress ratio effects were set for the compact specimens having thickness 12.7 mm. Relationship between crack growth rate and the stress intensity factor range were further identified with the stress ratio effects. The gradients of crack growth rate increase while the stress ratio, *R* increase. Higher *R*-ratio results in higher value range of minimum load applied. Paris law and Modified Forman law were used as comparison with the experimental data for validation purposes and to provide the level of precision.

Keywords; Aerospace Vehicles, Aluminum Alloy, Fatigue Crack Growth (FCG), Fracture Mechanics