THE FORMATION OF PRECIPITATE INFLUENCE RESISTANT ON STRESS CORROSION CRACKING OF AA 7075 ALLOY

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ABSTRACT

The AA 7075 alloy is classified as a high strength to weight ratio material and widely used in the structural aerospace. This alloy is susceptible to severe localized corrosion affected by heat treatments. The objective of this study was to find other alternative technique of heat treatments in reducing susceptibility to stress corrosion cracking (SCC). A series of different heat treatment process has been performed to AA 7075 alloy using a cube shape, round dumb-bell and C-ring specimens that were T6 temper, T7 temper and Retrogression and Re-aging (RRA) heat treatments. The tests were conducted on the specimens involved hardness test, tensile test, optical test and immersion test in a corrosive environment. The effectiveness of the heat treatments was measured by comparing the improvements of corrosion resistance and life time of AA 7075 alloy. The susceptibility of AA 7075 alloy to the SCC was related to the precipitation of $MgZn_2$ particles at the grain boundaries. Precipitation hardening of AA 7075 alloy has increased the hardness of the material but susceptible to SCC failure. However, RRA treatment greatly improved the corrosion resistance and life of AA 7075 alloy with a minimal reduction in strength. In this research, retrogression is carried out in oil bath using diesel engine oil and followed by re-aging at 120°C for 24 hours in electric oven. SCC tests were done using C-ring specimen under static stress in slightly acidify (pH 3) and aerated 3.56wt% NaCl solution at room temperature. Relatively high stresses in the ranges 273.32 to 309.83 MPa are applied to the specimen to accelerate SCC test. The fractured surfaces of the specimens were viewed under SEM to examine the morphology of striations.