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WELDS DEFECTS IN LASER BEAM WELDED T JOINT ALUMINUM-LITHIUM ALLOY

Abstract

Fabricating of aerospace structures with laser beam welding (LBW) technique possesses the advantages of weight reduction and high production rate than the traditional riveting techniques. Besides, the welded joints with this technique present higher resistance against corrosion and improved behavior under fatigue than riveting joints. Since material suppliers have reconsidered the strength advantages of the proposed material-concepts (Al-Li), developed decades ago, metallurgical research has been conducted to obtain better properties at reasonable material costs. Those alloys would allow lower structural weight and the same or even higher loads. The challenges for laser beam welding aluminum-lithium alloy are to provide appropriate, crack free joints with low porosity, resulting in high mechanical performance of the welded joint. However, because the Mg, Li and other chemical elements in Al-Li alloy are extremely active, the surface forms a high melting point oxide film, which can easily cause porosity. In addition, the low boiling point, high flowability, reflecting rate and thermal conductivity of aluminum alloy are prone to cause various defects, especially for the T joint structure. To solve the problems, characteristics of joint defects in laser beam welded T joint Al-Li alloy were studied. The results indicated that all the defects mentioned above could be controlled or avoided by optimizing the welding process procedures.