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Effect of Different Aging Processes on the Microstructure and Mechanical Properties of a Novel Al–Cu–Li Alloy

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The effects of different aging processes on the microstructure and mechanical properties of a novel Al–Cu–Li alloy have been investigated by X-ray diffraction, scanning electron microscopy and transmission electron microscopy. It is found that tensile properties of 2198 alloy are sensitive to aging processes, which corresponds to different microstructures. σ ($Al_5Cu_6Mg_2$) and T_1 (Al_2CuLi) phases are the major precipitates for the alloy in T6 aging condition (165 °C/60 h). After duplex aging condition (150 °C/24 h + 180 °C/12 h), σ, θ′ (Al_2Cu) and T_1 phases are detected. Only the T_1 phases can be found in the T8 state alloy (6% pre-strain+135 °C/60 h). The failure modes of alloy in T6 and duplex aging conditions are dimple-intergranular fracture, while typical quasi-cleavage fracture in T8 condition.

***Key words*:** Al–Cu–Li alloy; Aging process; Microstructure; Mechanical properties

1. Introduction

Al–Cu–Li alloy has extensive application in the field of aerospace, especially in rocket fuel tank and large passenger aircraft due to its low density, good comprehensive mechanical properties, good corrosion resistance, low fatigue crack propagation rate and other characteristics. Previous investigations using methods, like differential scanning calorimetry (DSC), transmission electron microscopy (TEM), X-ray diffraction (XRD), etc. have thoroughly researched the