

Low-cycle fatigue anisotropy and fracture behavior of the die-forged 2014 aircraft wheel

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Abstract

In order to provide a sufficient theoretical basis for the fatigue resistant design of the aircraft wheels, strain-controlled low-cycle fatigue (LCF) tests were carried out on specimens machined in the extrusion direction (ED) and transverse direction (TD) of die-forged 2014 aluminum alloy wheel. Although the TD specimens show lower tensile strength and yield strength, the fatigue test results reveal that the TD specimens show superior fatigue life compared with the ED specimens at total strain amplitudes of 0.5% ~ 0.8%. This is predominantly caused by the Al₁₂(MnSi)₂(FeCu) intermetallic particles near the surface layer lead to a relatively short crack initiation stage for the ED specimens. In contrast, TD specimens with finer and more uniform recrystallized grains have better resistance to fatigue crack initiation (FCI) and propagation (FCP).

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