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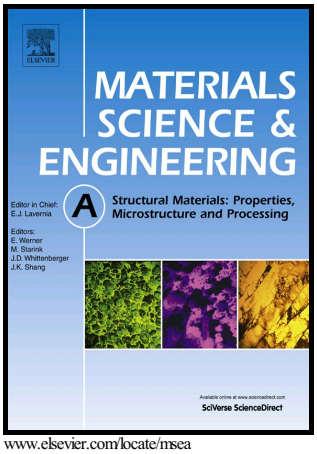

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Low Cycle Fatigue Behavior of Casting A319 Alloy under Two Different Aging Conditions

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ABSTRACT

To determine the influence of peak- and over-aging on low-cycle fatigue (LCF) behavior of casting A319 alloy, the strain controlled low-cycle fatigue tests was studied at room temperature under different total strain amplitudes. At lower total strain amplitudes (0.2%-0.3%), the A319 alloy presented initial cyclic hardening and then, steady stage and cyclic softening; while at higher total strain amplitudes (0.35%-0.4%), it presented continuous hardening in the peak-aged specimens and constant softening in the over-aged specimens. At a given total strain amplitude, the hysteresis loops in the peak-aged specimens were relatively narrower than those in the over-aged specimens. The fatigue life of the peak-aged samples was higher than that of the over-aged samples at any given total strain amplitude. Fractographic morphology indicated that the size of the fatigue crack propagation zone at peak-aged condition was larger than that at over-aged treatment. The crack characteristic in the propagation region and the fast fracture zone also showed some differences between two aging conditions.

Keywords：A319 aluminum alloy, low cycle fatigue, peak-aging, over-aging, fracture morphology, fatigue life

1. Introduction

In recent years, Al-Si casting alloys have been widely used in automotive and rail transportation industries as important lightweight constructional materials because of their good castability, low density, low shrink rate, and relatively high specific strength, such as automobile piston, wheel, cylinder, transmission housing and arm bolster of maglev train, etc [1,2,3]. As most of those structural components are often subjected to cyclic loading, fatigue properties of these cast aluminum alloys is critical