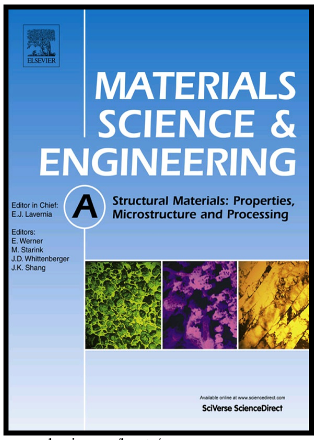

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Abstract: High cycle fatigue behavior of extruded and double-aged Mg-6Zn-1Mn alloy was investigated by servo-hydraulic fatigue testing machine with pull-push sinusoidal loading. Results show that double-aged alloy shows a deteriorative fatigue performance despite having excellent tensile strength. Twinning and detwinning mechanisms play a dominate role in fatigue deformation process in double-aged alloy. However, for extruded alloy, duo to the duplex grain structure, the fatigue deformation mechanism presents various deformation modes: in high stress regime (≥129 MPa) twinning takes part in fatigue process and appears in coarse grains, in low stress regime (≤125 MPa) fatigue deformation was dominated by slip. Microstructures of post-fatigue specimens are remarkably refined, room temperature recrystallization during fatigue has also been found in Mg-6Zn-1Mn alloy.

Key words: Magnesium alloy, Age hardening, High cycle fatigue, Twinning

1. Introduction

As the lightest materials among metals, magnesium (Mg) alloys are attractive for structural applications [1, 2]. Duo to their high specific strength, high specific stiffness, good castability, machinability and high damping capacity, Mg alloys are promising critical applications in the transportation industries, in particular, as load-bearing parts in aeroplanes and ground vehicles for which weight saving is extremely important [3, 4]. Wrought Mg alloys are usually cast defect-free and exhibit superior mechanical properties than cast Mg alloys. Consequently, wrought Mg alloys have found more promising applications for use as engineering components in the automotive industry and in some aerospace applications than cast ones [5, 6]. Since these engineering components are used under dynamic loading conditions, traditional static mechanical properties cannot evaluate their reliability effectively. Revealing the fatigue behavior of wrought Mg alloys is an effective method to ensure their reliability and safety in service.