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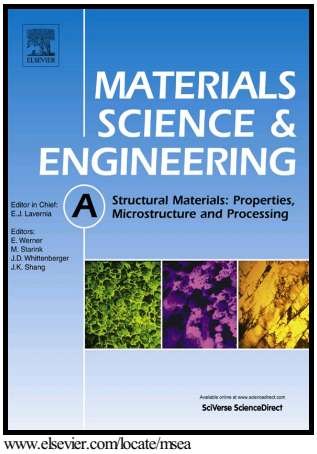

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Effect of heating rate on creep aging behavior of Al-Cu-Mg alloy

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Abstract

Creep age forming (CAF) has been developed to form large integral panels in aerospace industry. However, it is inevitable to impose a slow heating rate to heat the component and the tooling up for CAF application. The effect of the heating rate (1, 3 and 5 ℃/min) on creep aging behavior of Al-Cu-Mg alloy is investigated. It is found that the creep deformation during the heating process decreases with the increase of the heating rate. Nevertheless, the heating rate has little influence on the creep deformation during the subsequent soaking and cooling processes. During the heating process, increasing the imposed heating rate causes the GP zone dissolution and S phase formation peaks to occur at higher temperatures, and thus increase the heterogeneous precipitates in defects. After the creep aging process, the size of grain boundary precipitates and the width of precipitate free zone increase with the increase of heating rate. Thus, the yield strength, tensile strength and electrical conductivity reduce and the elongation improves slightly with the increase of heating rate. It indicates that the slow heating rate process can increase the creep deformation, improve the precipitates microstructure and enhance the comprehensive performance of mechanical properties and corrosion resistance.

Keywords

Creep age forming; 2524 aluminum alloy; Heating rate; Creep deformation; Mechanical properties; Microstructures;

1. Introduction

Al–Cu–Mg alloys are widely used in aircraft components because of their low