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A new cast Mg-Y-Sm-Zn-Zr alloy with high hardness

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Abstract

The microstructure and aging precipitates of a new cast Mg-Y-Sm-Zn-Zr alloy were investigated. The results showed that eutectic phase forming in solidification process was proved to be $(\text{Mg,Zn})_3(\text{Y,Sm})$. The alloy exhibited high hardness (maximum value of 148 HV), which is higher in comparison with other high rare-earth Mg alloy. The aging precipitate β' is thermally stable at 200 °C for the crystal structure of β' kept unchanged in the whole aging process.

Keywords: Mg-Y-Sm-Zn alloy; Cast; Microstructure; Hardness;

Introduction

Magnesium (Mg) alloys have been increasingly used in aerospace, automotive and portable electronic devices, where weight reduction is critical, owing to their high specific strength, good stiffness and excellent electronic conductivity [1]. However, current commercial Mg alloys provide limited mechanical properties and hinder its widespread applications. Recently, a series of Mg alloys containing rare-earth (RE) have been developed [2,3] with high performance, which results from precipitation hardening of nano-scale Mg-RE precipitates in the Mg matrix produced during aging treatment, solid solution strengthening and grain refinement.

It is reported by Rokhlin that Mg alloys containing two rare-earth metals belonging to different subgroups can promote strengthening effectively [4]. The WE

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