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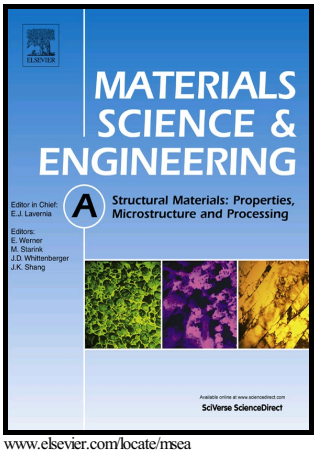

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Fabrication of high-strength Mg-Y-Sm-Zn-Zr alloy by conventional hot extrusion and aging

Shaoyuan Lyu, Wenlong Xiao*, Ruixiao Zheng, Fang Wang, Tong Hu, Chaoli Ma

Key Laboratory of Aerospace Advanced Materials and Performance of Ministry of Education, School of Materials Science and Engineering, Beihang University, Beijing 100191, China

∗ Corresponding author: Tel: +86-10-8233 8631; Fax: +86-10-8233 8631

E-mail: wlxiao@buaa.edu.cn (W. L. Xiao);

Abstract

A high-strength Mg-7Y-5Sm-0.5Zn-0.3Zr alloy was developed successfully by hot extrusion and subsequent aging treatment. The results showed that the as-solutionized alloy mainly contained α-Mg matrix and 14H LPSO phase distributed at grain boundaries. Lamellar LPSO and γ′ phases were dynamically precipitated during hot extrusion and retained after artificial aging treatment at 200^{o}C. After peak-aged treatment, the alloy exhibited excellent mechanical properties with ultimate tensile strength of 465 MPa, 0.2% proof stress of 413 MPa and elongation to failure of 6.5% at room temperature. The high yield strength was attributed to the combined action of 14H-LPSO phase, basal γ′ precipitates and dense distribution of β′ precipitates at prismatic plane.

Keywords: Mg-RE alloy; Extrusion; Microstructure; Precipitation; High strength.

1. Introduction

High-strength magnesium alloys have a great potential for improving fuel efficiency in aerospace and automotive industries [1]. One drawback is that current commercial Mg alloys have inadequate mechanical properties as compared with its counterpart aluminum alloys. It has been recognized that Mg rare-earths (REs) alloys containing medium and/or heavy REs show better mechanical performances at both room temperature and elevated temperature, which results from remarkable solute and precipitate strengthening [2,3]. To date, high-strength Mg-RE alloys are mainly based