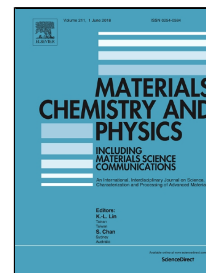


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Huseyin Zengin, Yunus Turen



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Effect of La content and extrusion temperature on microstructure, texture and mechanical properties of Mg-Zn-Zr magnesium alloy

Huseyin Zengin, Yunus Turen*

Karabuk University, Department of Metallurgy and Materials Engineering, 78050, Karabuk, Turkey

Abstract

The microstructure, texture and mechanical properties of Mg-6wt%Zn-0.5wt%Zr (ZK60) alloys with different La contents (0, 0.5 and 1 wt%) were investigated. The alloys were produced by low-pressure die casting and extruded at 300 °C and 400 °C, following homogenization at 400 °C for 24 h. La addition to ZK60 alloy resulted in a formation of Mg-Zn-La ternary phase, generating a semi-continuous network structure in their as-cast state. After extrusion, secondary phases were broken into fine particles distributed along the extrusion direction. These fragmented particles led to a nucleation of new grains around them i.e. particle stimulated nucleation (PSN), and promoted dynamic recrystallization (DRX) during extrusion. Therefore, increasing La content led to an increase in DRX fraction. Higher extrusion temperature resulted in larger DRXed grains and higher DRX fraction. The basal texture intensity was also decreased with increasing La addition and extrusion temperature by PSN mechanism and solute atoms of La. The ZK60-1La alloy extruded at 300 °C showed a superior yield strength of 311 MPa and ultimate tensile strength of 360 MPa as a result of significant grain refinement and dispersion strengthening. Increasing extrusion temperature resulted in a decrease in yield and ultimate tensile strengths and increase in ductility.

Keywords: ZK60 magnesium alloys; La modification; extrusion; microstructure; mechanical properties

* Corresponding author: yturen@karabuk.edu.tr

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