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Characterization the role of squeezing pressure on microstructure, tensile properties and failure mode of a new Mg-6Zn-4Al-0.5Cu magnesium alloy

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Abstract:

A new high-strength Mg-6Zn-4Al-0.5Cu alloy was fabricated by direct squeeze casting and the effects of applied pressure on the microstructure and mechanical properties of the squeeze-cast alloy were systematically investigated. The results showed that the squeeze-cast Mg-6Zn-4Al-0.5Cu alloy exhibits finer and much more uniform microstructure compared with gravity-cast one, but increasing the applied pressure doses not result in further grain refinement. The porosities are decreased markedly with increasing applied pressure and eventually disappear when the applied pressure is 90 MPa. The ultimate tensile strength and elongation of the alloy are obviously improved with the application of pressure, which is mainly attributed to the full density of the samples. In addition, the strength is further improved significantly after heat treatment. When the applied pressure is 60 MPa, the heat-treated Mg-6Zn-4Al-0.5Cu alloy exhibits the optimal tensile properties with the yield strength, the ultimate tensile strength and elongation of 216 MPa, 337 MPa and 12%, which are improved by 66%, 20% and 13% respectively as comparing with that of the as-cast sample.

Key words: magnesium alloy, squeeze casting, pressure, porosities, mechanical properties

1. Introduction

Squeeze casting is an advanced near net-shape process for manufacturing metal components. The microstructures and mechanical properties of squeeze-cast components are affected by many

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