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スリーブ加熱方式によるマグネシウム合金ダイカストの機械材料特性の向上

Improvement of Mechanical Properties of Materials for Magnesium alloy Die-casting by Heated Sleeve Systems

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Abstract

In this paper, in order to clarify the effect of heat on die casting of Mg-Al-RE alloy, the relationship between the die temperature and internal porosities were investigated. Furthermore, the mechanical properties exerted by the solidification microstructure were also investigated. Moreover, two sleeves that are equipped with each system that keeps the molten metal heated were newly developed. The cast samples were investigated using an X-ray CT scan, tensile tests, Vickers hardness tests, and solidification microstructure observations. As the die temperature increased, it was confirmed that porosities generation were suppressed while the tensile strength increased. The tensile tests and the X-ray CT scans revealed that the porosity volume increased due to partial fractures caused by stress concentration around the porosities. The tensile strength increased when the mold temperature is higher due to the increase of transgranular fractures in comparison to the intergranular fractures. It was also clearly clarified that the newly developed resistive heating sleeve promotes the growing of chilled layers where it eventually increased the Vickers hardness of the casting surface. Hence, this paper experimentally verified that it is effective to control heat by introducing the novel heated sleeve systems in die casting.

Key words

high-pressure die casting, magnesium alloy, die temperature, heated sleeve systems, tensile strength, porosity volume, microstructure

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