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급속응고 Mg-Zn-Y 합금의 성형특성

김택수#

Materials Properties of Rapidly Solidified Mg-Zn-Y Alloys

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Abstract

Light Mg alloy stands on the center of investigation due to the high potential of industrial application not only to the structural, but also to the functional fields. However, the intrinsic low strength and corrosion resistance have limited to extend its industrial use. In order to overcome the disadvantage, various attempts have been come to the modification of composition, resulting in finding Mg-Zn-Y alloys. The cast Mg-Zn-Y alloy leads to the high strength and hardness, low friction coefficient and low interfacial energy in both the ambient and elevated temperature.

However, rare report is given on the rapid solidification (RS) effect of the alloy due to extremely strong reactivity of Mg powders occurred during preparing, handling and working. Nevertheless, the RS will contribute to improve the mechanical properties of Mg-Zn-Y, corresponding to its well known effect such as grain refining, solid solubility, etc. In addition, powder metallurgy process (PM) via the rapid solidification regards as a promising route for the production various industrial parts with the precision, productivity and strength.

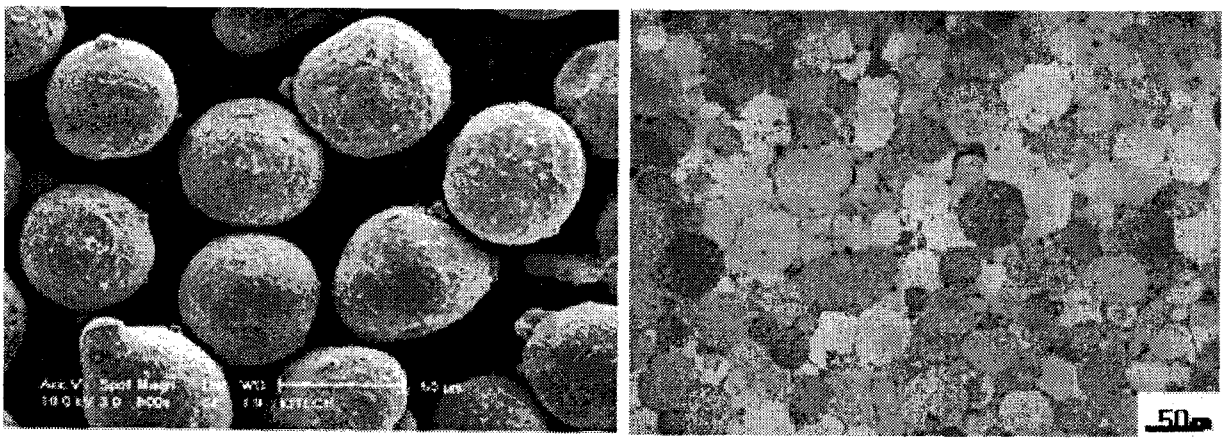

Fig.1 Mg-Zn-Y Powders as atomized and the bulk structure by SPS

In the investigation, the rapidly solidified Mg-Zn-Y powders were prepared by gas atomization method. The structure of the atomized powders and their consolidated bulks prepared by SPS and extrusion processes was investigated by X-ray diffractometry (XRD) and transmission electron microscopy (TEM). Mechanical properties of samples were also measured.

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The alloy powders present the spherical shapes with the same composition as designed (left photo of Fig. 1). The cumulative average powder sizes are about 30 ㎛. Fine and homogeneous microstructure as well as high density was obtained from the extruded and SPSed billets (right photo of Fig. 1).
Mechanical property of the SPSed samples was similar to the one of extruded with low area reduction ratio. In the extruded samples, the tensile strength was increased with increasing the extrusion ratio.

Key Words : Mg Powders, Gas Atomization, Extrusion, SPS, Strength