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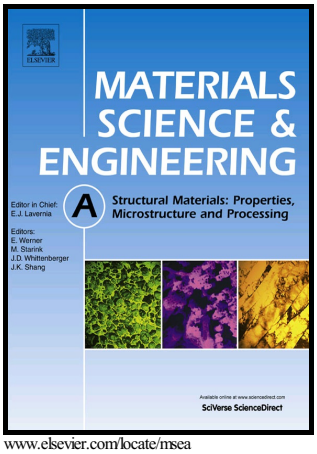

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Effects of Zn/Gd ratio on the microstructures and mechanical properties of Mg-Zn-Gd-Zr alloys

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Abstract

The microstructures and mechanical properties of three Mg-Zn-Gd-Zr alloys with specific Zn/Gd mass ratios to form different types of phases are systematically investigated by casting and subsequent indirect hot extrusion. With the Zn/Gd ratio increases from 0.27 to 1.4, second phases change from W ($Mg_3Gd_2Zn_3$), X ($Mg_{12}GdZn$) and $Mg_5(Gd,Zn)$ to W, I (Mg_3Zn_6Gd) and $MgZn_2$. After extrusion, the needle-like and dispersively distributed I-phase provides effective strengthening effects to the experimental alloys. The lamellar-like X-phase in the as-extruded condition is hard and fragile to start cracks. W-phase owns superior ductility in these alloys. A high performance I-phase containing Mg-7Zn-5Gd-0.6Zr alloy is prepared by conventional casting and subsequent hot extrusion. It owns an ultimate and yield strength of 350 MPa and 285 MPa, respectively, and its elongation is 13.6%.