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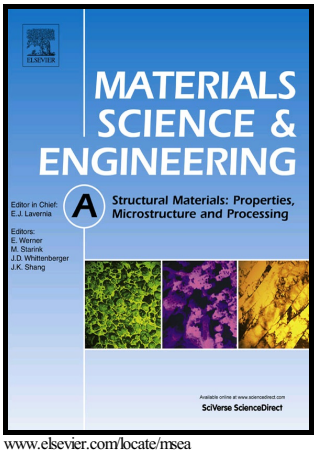

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Microstructure and mechanical properties of WE43 magnesium alloy fabricated by direct-chill casting

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Abstract

High quality WE43 magnesium alloy ingots with diameter of 500 mm are successfully fabricated by direct-chill (DC) casting. The alloying elements distributed almost homogeneously across the large ingot. With the average grain size decreasing from the center to the edge of the ingot, the mechanical properties are improved gradually. After solution treatment at 525^{o}C for 8h, the $Mg_{14}Nd_2Y$ phases distributing along the grain boundaries are well dissolved into matrix. The DC ingot exhibits remarkable age-hardening response from 85 Hv to 117 Hv after T6 treatment at 250^{o}C. The T6 peak-aged sample exhibits ultimate tensile strength of 274 MPa, yield strength of 215 MPa and elongation to failure of 3.4%, which are higher than those of sand-cast and permanent mold cast WE43 alloys. The large amount of nano prismatic β′ and β_1 phases precipitated during T6 treatment contributes to improved strength of the WE43 alloy.