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Microstructure and mechanical properties of Mg-Al-Zn alloy extruded by porthole die with different initial billets

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Abstract

Porthole die extrusion of Mg-Al-Zn alloy was conducted using the as-cast, as-homogenized and as-extruded billets. The effects of initial microstructure on grain size, secondary particle, texture and mechanical properties of the extruded profiles were investigated. The results showed that complete dynamic recrystallization (DRX) occurred in welding zone of all profiles, and the profile extruded from as-cast billet had the smallest DRXed grains. Large un-DRXed grains with {10-12} extension twins were found in the matrix zone of the profiles extruded from as-cast and as-homogenized billets. In welding zone, all profiles have a strong basal plane texture with {0001} directions parallel to transverse direction, while the texture intensity and distribution significantly varied with initial billets. The profile obtained from as-extruded billet exhibited inferior tensile properties due to its low solid bonding degree. The hardness distribution in matrix zone of the profiles was not uniform due to the inhomogeneous microstructure.

Key words: Mg-Al-Zn alloy; Porthole die extrusion; Microstructure; Mechanical properties.

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