

Effect Of Melt Conditioning On Heat Treatment And Mechanical Properties Of AZ31 Alloy Strips Produced By Twin Roll Casting

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ABSTRACT

In the present investigation, magnesium strips were produced by twin roll casting (TRC) and melt conditioned twin roll casting (MC-TRC) processes. Detailed optical microscopy studies were carried out on as-cast and homogenized TRC and MC-TRC strips. The results showed uniform, fine and equiaxed grain structure was observed for MC-TRC samples in as-cast condition. Whereas, coarse columnar grains with centreline segregation were observed in the case of as-cast TRC samples. The solidification mechanisms for TRC and MC-TRC have been found completely divergent. The homogenized TRC and MC-TRC samples were subjected to tensile test at elevated temperature (250–400 °C). At 250 °C, MC-TRC sample showed significant improvement in strength and ductility. However, at higher temperatures the tensile properties were almost comparable, despite of TRC samples having larger grains compared to MC-TRC samples. The mechanism of deformation has been explained by detailed fractures surface and sub-surface analysis carried out by scanning electron and optical microscopy. Homogenized MC-TRC samples were formed (hot stamping) into engineering component without any trace of crack on its surface. Whereas, TRC samples cracked in several places during hot stamping process.

KEYWORDS: Twin roll casting; Solidification; Tensile test; Fracture analysis; Optical and scanning electron microscopy

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