

عنوان مقاله:

Energy absorption study of warm-rolled dual-phase LZ71 magnesium alloy hollow tube using ANN

محل انتشار:

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خلاصه مقاله:

In the present work, the energy absorption study of warm-rolled LZ71 sheet is done for the first time. To do so, Lithium (7% Wt), Zinc (1% Wt) and Magnesium are cast in 770°C. After that, the billet has been warm-rolled at 350°C and its thickness reduced by 8%. Then, two different heat treatment situations are studied to reach an isotropic plate. Afterward, microstructures of the specimens have been studied using an optical microscope. Tensile tests of the samples are derived to study the mechanical properties and isotropy of the sheets. Moreover, the results of tensile tests applied for crushing simulations. Energy absorption study of the alloy is also done using ABAQUS/Explicit commercial code. The results of simulations are validated using experimental tests of A6082 and completely acceptable performance of simulations is observed. Then, the mechanical properties of LZ71 are used to study the crashworthiness behavior of the mentioned alloy. Crash absorption parameters, namely peak crush force (FMax), mean crush force (FMean), Total Energy Absorption (TAE), Crush Force Efficiency (CFE), Specific Energy Absorption (SEA) and Total Efficiency (TE) of LZ71 and A6082 are compared which are shown that the performance of LZ71 is considerably more efficient than A6082. Lastly, by the help of Artificial Neural Network (ANN) and Taguchi Method, the effects of dimensional parameters of tube, namely diameter, length and thickness, on FMax, FMean and TAE and also the influences of dimensionless geometrical ratios, namely L/D and D/t on CFE, SEA and TE are surveyed comprehensively.

کلمات کلیدی:

Crashworthiness, Warm rolling, LZ71, Magnesium Alloy, Crash simulation, Crash energy absorption, Artificial Neural Network

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