

عنوان مقاله:

Analysis of the strain rate effects on the crush behavior of the aluminum columns with different conditions of filling and cut-out

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خلاصه مقاله:

This article investigates the effects of strain rate variations on the plastic deformations of empty and polyurethane foam-filled aluminum columns by the experimental method. Half of the samples were perforated through the longitudinal sides of cross-section with 10 mm circular cut-outs. Three major groups of samples with different lengths of 100, 150 and 200 mm are studied by compressing the specimens between two rigid platens of DMG machine, Model 7166, axially. To investigate the strain rate effects, samples were loaded by three different rates of 3, 30 and 300 mm/min. The experiments indicate that in all cases, the onset of folding occurs from the cut-out and with inward direction. Generally, the total absorbed energy (TAE), specific absorbed energy (SAE), crush force efficiency (CFE) and peak crush load values are modified by using the foam-filler. The experimental observations indicate that the presence of cut-outs and foam-filler controls deformation mode during the axial compression behavior such that the folding mechanism in the perforated columns occurs more regularly. Analysis the results show that in the compressing tests on a particular specimen with the different strain rates, by increasing the loading rate, the TAE and SAE decrease, and the CFE firstly decreases and then increases. Approximately in over half of the cases, the peak load, contrary to the CFE state, firstly increases and then decreases during the increasing of jaw velocity from 3 to 30 mm/min. Also, the results illustrate that the peak load significantly and generally, decreases by increasing the strain rate.

کلمات کلیدی:

strain rate effects; axial loading; polyurethane foam; cut-out; energy absorption

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