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Impact of Truss Diameter and Heat Treatment on A356 Lattice Structures

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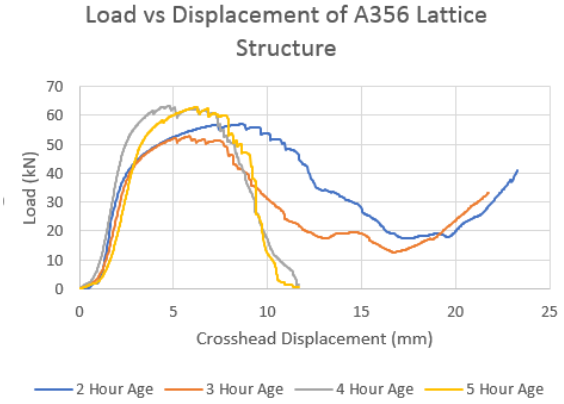
Abstract

Cellular truss materials offer excellent strength, high energy absorption and have low densities. In this presentation several truss samples were cast using A356 Aluminum. Samples were cast using 3-d printed sand molds that were manufactured by ExOne. Cast samples with varying truss diameters of 4mm, 4.5mm and 5mm were poured. Next the lattice structures were subjected to a T6 heat treatment. This treatment involved solutionizing the A356 alloy at 1000 F for 8-12 hours in order to spheroidize the silicon and dissolve any strengthening precipitates into a homogenous solid solution. Immediately after solutionizing the structures were rapidly quenched in water. After at least 12 hours of natural aging the samples were artificially aged at 312 F for 4 hours. The artificial aging allows for Mg2Si strengthening precipitates to form. Finally, the lattices were tested in compression. Additional 4mm diameter truss structures were cast and were subjected to a variable T6 aging treatment. Artificial aging occurred at 312 F for 2 hours, 3 hours, 4 hours and 5 hours. Compression testing was performed again in order to determine the optimal aging time for maximizing the energy absorption of the lattice structures.



Biography.

Alec Labitt is an M.Eng. student who began taking graduate courses in the Spring of 2018. He will be graduating in the Spring of 2019. Alec works in Dr. Druschitz's group. His research focuses on the heat treatment and mechanical behavior of A356 lattice structures.