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Energy Absorption Capacity of Aluminium Foam Manufactured by Kelvin Model Loaded Under Different Biaxial Combined Compression-Torsion Conditions

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Abstract : Aluminum foams were developed and tested due to their high energy absorption abilities for multifunctional applications. The aim of this research work was to investigate experimentally the effect of quasi-static biaxial loading complexity (combined compression-torsion) on the energy absorption capacity of highly uniform architecture open-cell aluminum foam manufactured by kelvin cell model. The two generated aluminum foams have 80% and 85% porosities, spherical-shaped pores having 11mm in diameter. These foams were tested by means of several square-section specimens. A patented rig called ACTP (Absorption par Compression-Torsion Plastique), was used to investigate the foam response under quasi-static complex loading paths having different torsional components (i.e., 0°, 37° and 53°). The main mechanical responses of the aluminum foams were studied under simple, intermediate and severe loading conditions. In fact, the key responses to be examined were stress plateau and energy absorption capacity of the two foams with respect to loading complexity. It was concluded that the higher the loading complexity and the higher the relative density, the greater the energy absorption capacity of the foam. The highest energy absorption was thus recorded under the most complicated loading path (i.e., biaxial-53°) for the denser foam (i.e., 80% porosity).

Keywords : open-cell aluminum foams, biaxial loading complexity, foams porosity, energy absorption capacity, characterization
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