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PROCESSING AND DYNAMIC PROPERTIES OF STRUCTURAL ENERGETIC COMPOSITE MATERIALS COUPLING LINEAR CELLULAR ALLOYS WITH THERMITE MIXTURES

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Abstract

Structural energetic composite materials based on coupling of Linear Cellular Alloys (LCAs) with thermite powder mixtures are being investigated. The focus is on manipulating the LCA material and channel design, such that transfer of shear stresses from casing to energetic filler provides control of reaction initiation in the filler and patterned fragmentation of the casing. The deformation and fragmentation response of 25% dense LCA casings made from high-strength steels, with waffle- and pie-shaped cell geometries, has been determined and correlated with predictions from AUTODYN simulations. The dynamic densification and thermo-chemical reactivity of Ta+Fe2O3 and Ta+Bi2O3 thermite mixtures under uniaxial strain and uniaxial stress loading has also been determined. The results highlighting the unique attributes of LCA casings with geometries designed to enable controlled transfer of shear stresses to the reactive filler upon impact, will be presented.

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