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Metallic Microlattice Materials: A Current State of The Art on Manufacturing, Mechanical Properties and Applications

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Abstract
Metallic microlattice is a new class of material that combines useful mechanical properties of metals with smart geometrical orientations providing greater stiffness, strength-to-weight ratio and good energy absorption capacity than other types of cellular materials used in sandwich construction such as honeycomb, folded and foam. Metallic microlattices consist of micro struts stacked in different arrangements and most of the volume is occupied by air voids. Relative density and strut stacking order are the prime design variables of this ultralight material and the mechanical properties could be engineered by controlling these parameters. The base metal i.e. stainless steel, titanium alloy etc. used in producing microlattices, obviously, would affect its behavior. A number of processes are reported in literature to produce metallic microlattices, which could significantly affect its mechanical properties. This paper presents an overview of manufacturing and processing of microlattices with the corresponding mechanical properties. Current techniques adopted for modeling its structural response are discussed herein. Possible future uses of microlattices and the demonstrated use of cellular materials analogous to applications of microlattices are also explored in this paper as practical applications are yet to be demonstrated for this innovative ultralight material.