ICCES, 2024, vol.31, no.3
DOI: 10.32604/icces.2024.012843

PROCEEDINGS

The Quasi-Static Compressive Properties and Energy Absorption Behavior of Alumina/Aluminum Lattice Structure Composites

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ABSTRACT

Aluminum lattice structures have the advantages of lightweight, high specific strength/stiffness and excellent plasticity, while alumina ceramic lattice structures usually show high strength and significant brittleness. Therefore, alumina/aluminum interpenetrating composites can combine two distinct mechanical properties and show superior performance, which is beneficial to applications in aerospace and military industries. In this study, alumina ceramic lattice structures were prepared by additive manufacturing (AM) and used as infiltration skeleton. The molten aluminum was then infiltrated into alumina ceramic lattice structures. By this method, the alumina/aluminum ordered structure composites were prepared. Through mechanical experiments and finite element methods, the quasi-static compressive properties and energy absorption behavior of alumina/aluminum interpenetrating composites were analyzed. It was found that the metal aluminum acted as the matrix with good plasticity and ductile, and the alumina ceramic as the reinforcement showed high strength. Mutual mechanical interlocking and constraints between the ceramic and metal were beneficial to the improvement of mechanical properties and energy absorption behavior of ceramic/metal interpenetrating composites.

KEYWORDS

Interpenetrating composites; energy absorption behavior; infiltration method; mechanical interlocking

Funding Statement: This work was supported by the National Natural Science Foundation of China (Grant No.12102335) and the China Postdoctoral Science Foundation (2021M702604).

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.