

Periodic Cellular Structure Technology for Shape Memory Alloys

Unique approach offers low-cost fabrication method

Shape memory alloys are being considered for a wide variety of adaptive components for engine and airframe applications because they can undergo large amounts of strain and then revert to their original shape upon heating or unloading. Transition45 Technologies, Inc., has developed an innovative periodic cellular structure (PCS) technology for shape memory alloys that enables fabrication of complex bulk configurations, such as lattice block structures. These innovative structures are manufactured using an advanced reactive metal casting technology that offers a relatively low cost and established approach for constructing near-net shape aerospace components. Transition45 is continuing to characterize these structures to determine how best to design a PCS to better exploit the use of shape memory alloys in aerospace applications.

Applications

NASA

- ▶ Engine and airframe components:
 - Actuators
 - Flexible wings
 - Nozzles
 - Ballistic impact-resistant structures

Commercial

- ▶ Structural building and bridge components that resist explosions and earthquakes
- ▶ Armor
- ▶ Automobile spoilers
- ▶ Shipboard structures
- ▶ Biomedical implants
- ▶ Firefighting equipment
- ▶ Heating, ventilation, and air conditioning (HVAC) equipment
- ▶ Sporting goods



Phase II Objectives

- ▶ Design, exploit, and maximize the performance benefits of cast shape memory alloys in the form of PCSs and solids
- ▶ Examine how well PCSs of various designs perform in recovery compared with a solid of the same alloy
- ▶ Quantify structural benefits of PCS technology

Benefits

- ▶ Lightweight
- ▶ Acoustic dampening
- ▶ Impact resistant
- ▶ Flexible
- ▶ Strong

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