

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IPB)

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USE OF SHAPE-MEMORY ALLOY – SHAPE-MEMORY POLYMER COMPOSITES IN RE-ENTRY
VEHICLES

Abstract

Shape memory alloy and polymers are two different kinds of shape-memory materials that can be colluded to be utilized in the aerospace industry. This paper delves into the development of a composite that can handle thermal cycling and possess optimum mechanical properties for the usage in the heat-shield actuation of the re-entry vehicles.

The materials that are discussed in the paper includes Nitinol and PTFE. The heat shield while being compact and light has to be fitted onto the vehicle. As the heat has opposite effects on the shape memory alloy (hardening) and thermoplastic SMP (softening), this property is leveraged for the inflation of the heat shield onboard the re-entry vehicles. During atmospheric re-entry, the vehicle is subjected to tremendous amounts of heat. Along with the development of the composite, its dynamic response, crack propagation and closure as well as the thermo-mechanical responses are studied. The composite is packed efficiently to deploy on its journey back to earth.

The development of such composites can help in improving the overall safety of the re-entry vehicles and paving way for many other space-related applications.