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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (9)

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SPACE MISSION OPPORTUNITIES USING SHAPE MEMORY COMPOSITES

Abstract

Future space missions will require large space infrastructures in order to achieve scientific and technological objectives characterized by an intrinsec complexity. These goals require huge masses to be put in orbit resulting in cost increasing. Currently one of the most promising technology is an inflatable composite structure packed inside a conventional launcher, that once in orbit is deployed and then rigidized becoming a space structure. Among several applications we can cite truss structures, solar reflectors, space station's modules, antennas and solar sails. This paper will focus on both mission and material characterization for shape memory composites (SMCs) to be applied on such applications; particularly since solar sail is a very complex system, it could be considered as a general technology for any space application including folding, deployment and rigidization phases. In this study, a typical mission is analyzed including constraints and pro/contra analysis. Moreover some composite prototypes have been selected and tested within an experimental laboratory campaign. Test campaings were devoted to understand the material behaviour under space environmental conditions inlcuding temperature, radiation and vacuum variability.