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Introduction: Passive and Active Materials for Gossamer Spacecraft

IN this the third of four special sections of the *Journal of Spacecraft and Rockets*, we are pleased to be able to bring you a selection of papers originally presented at the 2001 Gossamer Spacecraft Forum (42nd AIAA Structures, Structural Dynamics, and Materials Conference, Seattle, Washington). Gossamer spacecraft (GS) have captured the imagination of many engineers and scientists of late because the technology is enabling of many applications and missions such as large communications and imaging apertures, solar sails and solar thermal propulsion, and planetary exploration and habitation.

New developments in materials are one of the critical elements enabling GS. Low inherent densities, high packagability, and low cost are the essential ingredients of gossamer materials. Many other characteristics are desirable as well in different applications: 1) low CTE, 2) shape memory, 3) excellent surface finish, 4) damage tolerance and repairability, 5) rigidizability, 6) uniformity of dimensions and properties, and 7) multifunctionality.

Particular emphasis has recently been placed on materials that are rigidizable on orbit, perhaps by evaporation, UV cure, thermal cure, or overstressing. Shape memory materials, especially polymers, have also received considerable interest of late.

Active materials, e.g., those that change shape upon application of external voltage, are crucial to the maintenance and function of certain GS, such as precision apertures. Multifunction, rather than merely attaching active patches, is essential to meet weight and performance targets.

We are pleased to be able to bring a selection of recent reports on such issues to you.

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