MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

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THERMAL PROPERTY AND MICROSTRUCTURE CONTRAST OF THREE KINDS OF CARBON/SILICON CARBIDE COMPOSITES

Abstract

One of the key technologies for the high performance reconnaissance satellites and large-scale space telescopes with reflectors is fabrication of a very lightweight material with high specific stiffnesslow thermal expansion and high thermal conductivity. As the most preferential candidate at present, carbon/silicon carbide (C/SiC) composite has many special advantages, such as: no toxicity, easy assembly, ultra-light weight capability. Several preparation methods can be utilized to make the C/SiC composites green bodies, which are discussed respectively. Thermal property and microstructure contrast of C/SiC via reactive molten infiltrationRMI, chemical vapor reaction (CVR) and RMI-CVR are depicted in this article. It is shown that C/SiC made by RMI possess of lower coefficient of thermal expansion and high thermal conductivity. And after microstructure observation, it was found that C/SiC made by CVR and RMI-CVR have different levels of micro pores. Carbon fibers in the composites mentioned above have been damaged at the same time, while similar state was not found in C/SiC made via RMI. In order to get an isotropy composite and to meet the optical and opto-mechanical requirements, two kinds of carbon fiber preforms, integrated felt and needle-formed fabric felt, were selected and desified firstly to a proper density using chemical vapor infiltration (CVI) to form carbon layers around carbon fibers. Upon completion of the preparation of carbon/carbon C/C composites green bodies, they had been high temperature treated under 1800 and then been light-weight machined to form complicated ribs in the backs and been finished the siliconization process to form the final C/SiC composites. Ultra-light weight capability of the two C/C greenbodies was evaluated. Mechanical, thermal properties of C/SiC composites were evaluated too. It was found that both of two C/C greenbodies can been light-weight machined to form ribs with 1.5mm thickness in each directions, and C/SiC composite with integrated felt preform has a higher isotropy level than the other one.