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FIBER CONTENT EFFECT ON THE PERFORMANCE OF CARBON /CARBON COMPOSITES

Abstract

Carbon matrix/ carbon fiber (C/C) material is a carbon fiber reinforced carbon matrix composites, which have the high strength and elastic modulus at high temperature, good thermal conductivity, excellent characteristics of resistance to erosion and high chemical stability, mechanical strength at high temperature. It has been successfully used in the manufacture of aviation engine nozzle and thermal assemblies of the firebox as well as brake discs for airplane in the aeronautical, astronautical, military, and civil fields. Carbon fiber is an important part of the carbon / carbon composites and also is the main skeleton of the material. The content of carbon fiber has a great influence on the performance of the material. In this paper, the different fiber content (16wt%, 22 wt% and 27 wt%) of carbon / carbon composite's mechanical properties (tensile strength, compressive strength and flexural strength), thermal properties (coefficient of thermal expansion and thermal conductivity), and ablation resistance (plasma ablation rate) were studied. Three preforms were made by different content of fiber , then were densified by chemical vapor deposition (CVI) and resin impregnation / carbonization RICrepeatedly. The final density of carbon / carbon composites was 1.80g/cm³. And the same time, the performance and scanning electron microscopy microstructural were analyzed. The results showed that: when the carbon fiber content is 27%, the tensile strength, compressive strength, flexural strength and thermal conductivity of carbon / carbon composites were maximum. But carbon fiber content of 16% is minimum. With the increase of the fiber content, the properties of above had rising trends. However, when the carbon fiber content is 16%, the coefficient of thermal expansion and plasma ablation rate were maximum and the carbon fiber content of 27% was minimum. With the increase of the fiber content, the properties of above were decreased. All carbon / carbon composites' fiber and matrix are linked closely together from SEM analysis. Therefore, the carbon / carbon composites as aerospace structural components which has a strong design performance. Different parts of the aerospace could be designed by different carbon fiber content.