

温度脉冲方法制备碳/碳化硅复合材料界面的微观结构与性能研究

袁明, 黄政仁, 董绍明, 朱云洲, 江东亮

中国科学院 上海硅酸盐研究所, 上海 200050

收稿日期 2006-3-29 修回日期 2006-6-19 网络版发布日期 2007-3-10 接受日期

摘要

采用温度脉冲化学气相渗透沉积的方法制备了碳/碳化硅复合材料界面. 以六甲基二硅胺烷 (Hexamethyldisilazane, HMDS) 为前驱体, 以3k, 三维四向的石墨化碳纤维编织体为预制体, 通过强制流动热力学梯度化学气相渗透沉积的方法(FCVI)制备出密度为 $1.98\text{g}\cdot\text{cm}^{-3}$ 的 $\text{C}_f/\text{SiC}$ 复合材料. 运用透射电子显微镜(TEM)对复合材料的界面微观结构进行了分析. 复合材料的平均弯曲强度为458MPa, 平均断裂韧性为 $19.8\text{MPa}\cdot\text{m}^{1/2}$ . 应用扫描电子显微镜(SEM)对复合材料的断裂形貌进行了分析研究.

关键词 [C/SiC复合材料](#) [化学气相渗透](#) [微观结构](#) [断裂形貌](#)

分类号 [TB383](#)

## Carbon/Silicon Carbide Composites with Interphases Processed by Temperature-pulsing Chemical Vapor Infiltration Technique

YUAN Ming, HUANG Zheng-Ren, DONG Shao-Ming, JIANG Dong-Liang

Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 200050, China

### Abstract

A novel method of temperature-pulsing chemical vapor infiltration (T-pulsing CVI) was introduced. And interfacial coatings of silicon carbide (SiC) layer and pyrolytic carbon (PyC) layer were processed via the route. 3D carbon fiber preforms were densified by forced-flow thermal-gradient chemical vapor infiltration (FCVI) with the precursor of hexamethyldisilazane (HMDS). The microstructure of interphases was investigated by transmission electron microscope (TEM). The configuration of specimens' fracture surface was observed by scanning electron microscope (SEM). Results show that the density of the composites is  $1.98\text{g}\cdot\text{cm}^{-3}$ . The thickness of the SiC layer estimated is 20nm, and 50nm for the PyC layer. The average flexural strength of the composites is 458MPa at room temperature, and the average fracture toughness is  $19.8\text{MPa}\cdot\text{m}^{1/2}$ .

**Key words** [ceramic-matrix composites \(CMCs\)](#) [chemical vapor infiltration \(CVI\)](#) [microstructure](#) [fracture surface morphology](#)

DOI:

通讯作者 袁明 [myuan@mail.sic.ac.cn](mailto:myuan@mail.sic.ac.cn)

扩展功能

### 本文信息

▶ [Supporting info](#)

▶ [PDF\(1433KB\)](#)

▶ [\[HTML全文\]\(0KB\)](#)

▶ [参考文献](#)

### 服务与反馈

▶ [把本文推荐给朋友](#)

▶ [加入我的书架](#)

▶ [加入引用管理器](#)

▶ [复制索引](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

### 相关信息

▶ [本刊中 包含“C/SiC复合材料”的相关文章](#)

▶ [本文作者相关文章](#)

- [袁明](#)
- [黄政仁](#)
- [董绍明](#)
- [朱云洲](#)
- [江东亮](#)