中国有色金属学报
中国有色金属学报(英文版)
中国科学技术协会 主管
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论文摘要

中国有色金属学报
ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO
第19卷 第1期 (总第118期) 2009年1月

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文章编号：1004-0609(2009)01-0070-07

三维机织C/C复合材料的摩擦磨损性能

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摘 要： 采用碳纤维织造了三维角联锁和三向正交2种不同三维机织物，首先采用化学气相渗透(CVI)使其致密，再采用液相树脂浸渍/碳化的补充增密技术，制备出粗糙层结构热解碳和树脂碳双元基体C/C复合材料；对该C/C复合材料进行摩擦磨损实验，采用光学显微镜、扫描电镜对三维机织物增强的C/C复合材料的摩擦面以及磨屑形貌进行观察，对其磨损机理进行分析。结果表明：三维角联锁C/C复合材料比三向正交C/C复合材料的摩擦因数低(分别为0.40和0.48)，二者的摩擦性能均稳定，后者比前者磨损量小，说明*Z*向纤维束有利于提高摩擦因数并降低磨损量。

关键字： C/C复合材料；摩擦；磨损；三维机织预制体

Friction and wear properties of 3D woven reinforced C/C composites

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Abstract: Two different kinds of structural preforms were designed and manufactured using carbon fiber, which were 3D angle-interlock structure and 3D solid orthogonal panel structure. C/C composites with mix pyrolytic carbon and resin carbon matrix, were made firstly by chemical vapor infiltration (CVI) and then liquid resin impregnation for complementary. The tribological properties of the two 3D woven reinforced C/C composites were measured. The surface microstructure and wear debris on the wear-induced surfaces of 3D woven fabric C/C composites disks were investigated by optical microscopy and scanning electron microscopy. The friction and wear mechanism were researched. The results show that 3D angle-interlock weave reinforced C/C composites behaves lower average coefficients of friction than 3D solid orthogonal panel weave reinforced C/C composites of about 0.40 and 0.48, respectively, whereas the properties of friction are stable. The wear rate of the latter is less than that of the former. The existence of *Z* direction fiber is propitious to increasing the coefficients of friction and decreasing the wear rate.

Key words: carbon-carbon composites; friction; wear; 3D woven preform

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