

### 三维机织陶瓷基复合材料的面内剪切性能及损伤研究

常岩军, 矫桂琼, 王波, 管国阳, 卢智先

西北工业大学 力学与土木建筑学院, 西安 710072

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**摘要** 采用IOSIPESCU纯剪切试件, 考虑纤维的编织结构和失效机理, 研究了三维机织碳/碳化硅(C/SiC)复合材料在面内剪切载荷作用下的力学性能和损伤过程. 材料具有明显的非线性应力-应变行为和残余变形等特性. 材料主要的损伤机制为基体微裂纹开裂, 界面脱粘和纤维断裂, 其中界面裂纹是材料应力-应变等力学行为的主要影响因素. 基于连续介质损伤力学分析方法, 提出了简单的损伤演化模型并对损伤演化过程进行了描述.

**关键词** [陶瓷基复合材料](#) [三维机织](#) [损伤演化模型](#) [临界应变](#)

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### Mechanical Properties and Damage Process of a Three-dimensional Woven Ceramic Composite under In-plane Shear Loading

CHANG Yan-Jun, JIAO Gui-Qiong, WANG Bo, GUAN Guo-Yang, LU Zhi-Xian

School of Mechanics and Civil Construction, Northwestern Polytechnical University, Xi'an 710072, China

**Abstract** The mechanical behavior and damage process of a three-dimensional woven carbon/silicon carbide (C/SiC) composite under in-plane shear loading were investigated with IOSIPESCU specimens in relation with the failure mechanisms and the fiber architecture. The C/SiC composite exhibited several interesting features including an essentially non-linear stress-strain behavior and permanent deformations. The results show that the major damage mechanisms are matrix microcracks cracking, interface debonding and fiber breaking. The delamination cracks affect mainly the stress-strain behavior and the mechanical properties. A damage model is proposed based upon continuum damage mechanics to describe the damage evolution.

**Key words** [ceramic composites](#) [3D woven](#) [damage model](#) [critical strain](#)

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通讯作者 常岩军 [yanjun-chang@126.com](mailto:yanjun-chang@126.com)

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