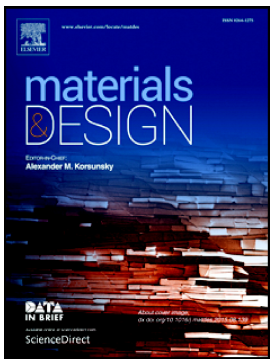

Effect of pyrolytic carbon interface thickness on conductivity and mechanical and wear properties of copper mesh modified carbon/carbon composite

Pei Wang, Hongbo Zhang, Jian Yin, Xiang Xiong, Chaoyong Deng, Xiaoguang Wu

PII: S0264-1275(18)30416-7
DOI: doi:10.1016/j.matdes.2018.05.031
Reference: JMADE 3931

To appear in: *Materials & Design*

Received date: 24 January 2018
Revised date: 13 May 2018
Accepted date: 14 May 2018

Please cite this article as: Pei Wang, Hongbo Zhang, Jian Yin, Xiang Xiong, Chaoyong Deng, Xiaoguang Wu , Effect of pyrolytic carbon interface thickness on conductivity and mechanical and wear properties of copper mesh modified carbon/carbon composite. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), doi:10.1016/j.matdes.2018.05.031

Effect of pyrolytic carbon interface thickness on conductivity and mechanical and wear properties of copper mesh modified carbon/carbon composite

Pei Wang, Hongbo Zhang, Jian Yin*, Xiang Xiong, Chaoyong Deng, Xiaoguang Wu

Science and Technology on High Strength Materials Laboratory, Central South University, Changsha 410083, PR China

ABSTRACT: Carbon fiber/copper fiber-reinforced carbon matrix composite, a kind of novel sliding contact strip material, was fabricated using a chemical vapor infiltration (CVI) technology, following by furan resin impregnation and carbonization processes. To improve the interface combination, pyrolytic carbon (PyC) with different layer thicknesses (0-18.86 um) were formed on the copper and carbon fiber surfaces via controlling deposition time of the CVI. Microstructure, electrical conductivity, flexural strength and current-carrying friction performances were investigated. The results showed the dominant affecting factor on the material performances was the microstructure of matrix carbon. The electrical conductivity increased with increasing of the PyC layer thickness, which was an approximate linear collection. As compared to the one without the PyC interface, C_f/Cu_f-C composites with PyC interface increased flexural strength and wear resistance by more than two times owing to the effective protection for carbon fibers and copper fibers. In addition, three physical models were used to describe wear mechanisms of C_f/Cu_f-C composites with different PyC layer thicknesses.

Keywords: Copper fiber; Carbon fiber; Wear; Electric current; Pyrolytic carbon interface.

1. Introduction

The electric power is transmitted from the pantograph/catenary system to the locomotive in

* Corresponding author. Tel.: +86 7315707494717; fax: +86 7315707494717. E-mail address: zhongnanwp@csu.edu.cn (J. Yin).