Accepted Manuscript

Interfacial adhesion properties of carbon fiber/polycarbonate composites by using a single-filament fragmentation test

Ting-Ting Yao, Gang-Ping Wu, Chang Song

PII: S0266-3538(16)30754-0

DOI: 10.1016/j.compscitech.2017.06.017

Reference: CSTE 6812

To appear in: *Composites Science and Technology*

Received Date: 19 July 2016

Revised Date: 28 May 2017

Accepted Date: 16 June 2017

Please cite this article as: Yao T-T, Wu G-P, Song C, Interfacial adhesion properties of carbon fiber/ polycarbonate composites by using a single-filament fragmentation test, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.06.017.

Interfacial adhesion properties of carbon fiber/polycarbonate composites by using a single-filament fragmentation test

Ting-Ting Yao [a, b], Gang-Ping Wu [a,*],Chang Song [a]

[a] National Engineering Laboratory for Carbon Fiber Preparation, Institute of Coal Chemistry, Chinese Academy of Sciences, Taiyuan 030001, China

[b] University of Chinese Academy of Sciences, Beijing 100049, China

ABSTRACT

To reveal the interfacial adhesion nature between a carbon fiber (CF) and its surrounding polycarbonate (PC) matrix, the carbon fibers were electrochemically oxidized to differentiate the surface roughness and chemistry status. The fiber surfaces were characterized by SEM, XPS, AFM and dynamic contact angle measurements. Both Surface-coating and hot-pressing methods were adopted to prepare specimens for evaluating the CF/PC interfacial adhesion properties by single fiber fragmentation tests. The surface-coating method gave a relatively weak interfacial shear strength (IFSS) result, which varied almost monotonously with the fiber surface roughness, suggesting that in this case the interfacial properties should be dominated by a mechanical interlocking mechanism. However, the hot-pressing process gave a 46-81% higher IFSS result than the solution-coating one, and the IFSS data increased almost linearly with polar component of the carbon fiber surface energy. It was very possible that the interfacial adhesion properties were largely controlled by the chemical reactions (e.g., ester-exchange reaction) at high temperature, which were easy to occur in the presence of oxygenated functionalities at CF surfaces.

Key words: Carbon fibers; Polycarbonate; Interface; Adhesion; Thermoplastic

1. Introduction

Carbon fiber reinforced thermoplastics (CFRTPs) are an ideal structural materials due to their

* Corresponding author. Tel: +86-351-2112353, E-mail address: wgp@sxicc.ac.cn (G.P. Wu)