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

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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

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