ADVANCES IN MATERIALS ENGINEERING

Volume 2

Edited By:
Md Abdul Maleque
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Chapter 028

Surface Topography of Sulphuric Treated Carbon Fibre

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Abstract. Surface treatment of carbon fiber is essential to improve interfacial bonding between fibers and matrix. In this chapter, short carbon fibre (CF) was subjected to 1M sulphuric acid treatment and then refluxing with 1M sodium hydroxide (NaOH). The effects of oxidative treatment on CF were observed under scanning electron microscope (SEM) and atomic force microscope (AFM). SEM micrograph revealed the rough surface of Sulphuric treated CF. The formation of roughed surface and deeper pitting/grooves as compared to untreated short carbon fibre was supported by AFM image on sulphuric treated carbon fibre.

Introduction

The interlaminar shear strength of carbon fibre reinforced composites is related to the fibre-matrix interfacial bonding. The bond can be in the form of physical which is due to mechanical interlocking between the fibre-matrix or chemical bonds between the matrix and the active sites on the fibre surface. The active sites are located at the edges of the crystallite basal planes emerging at the surface, structural defects such as vacancies, dislocations or steps in the basal planes oriented parallel to the fibre axis [1]. Mechanical interlocking is determined by fibre surface area, the surface porosity and surface roughness. The fibre surface morphology is dependent on the precursor material where polyacrylonitrile (PAN)-based fibres exhibited smaller surface area with smooth surface and circular cross section.

Oxidative surface treatment of carbon fibres has been found to lead a considerable improvement in mechanical properties of fibres. The surface treatment, changes the surface chemistry of the carbon fibres and is the key factor that affects the final mechanical properties of the composite. The main purpose of surface treatment is to modify the inert nature of carbon fibre surfaces. The changes caused by the treatment applied and the interface between the carbon fibre surface and matrix material can be monitored by surface science method [2].

The surface topography of PAN based carbon fibre is comprised of many wrinkles or ridges running along the fibre axis [3]. The crystal basal surfaces of completely bonded carbon atoms are rather chemically inert. Hence, the more chemically active sites on a graphite crystal surface are located at incompletely bonded edges and faults in the structure [4]. This graphitic and the aligned fibre's, resulted in less potential for chemical bonding.