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Influence of chemical treatments on mechanical properties of hemp fiber reinforced composites

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Abstract

Natural Fibers Reinforced Composites (NFRC) are finding much interest as a substitute for glass or carbon reinforced polymer composites, like for instance automobile interior linings (roof, rear wall, side panel lining), shipping pallets, construction products (i.e. composite roof tiles), furniture and household products (i.e. storage containers, window and picture frames as well as food service trays, toys and flower pots) as well as fan houses and blades.

However, a notable disadvantage of lignocellulosic fibers as reinforcements is their polarity which makes it incompatible with hydrophobic thermoplastic matrix. This incompatibility results in poor interfacial bonding between the fibers and the matrix. This in turn leads to impaired mechanical properties of the composites. This defect can be remedied by chemical modification of fibers so as to make it less hydrophilic.

In this paper experiments have been performed to further the development of natural fiber reinforced composites. Untreated and treated surfaces of hemp fibers were characterized using Fourier Transform Infrared (FTIR) spectroscopy and Scanning Electron Microscopy (SEM).

Fiber-matrix adhesion was promoted by fiber surface modifications using an alkaline treatment and (3-Glycidyloxypropyl) trimethoxysilane coupling agent. The mechanical behaviour of epoxy matrix composite reinforced with woven hemp was studied and mechanical test results show that silane treatment of hemp fibers improves, both tensile and flexural properties of the composites, although no high values are obtained.

1 Introduction

Natural fibers are increasingly being considered as an environmentally friendly substitute for synthetic fibers in the reinforcement of polymer based composites [1-6]. In fact these fibers