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RESEARCH ARTICLE

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Characterization of chemically treated new natural cellulosic fibers from peduncle of *Cocos nucifera* L. Var typica

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Abstract

The aim of this study is to look into the effect of chemical treatments on fibers extracted from the unbranched portion of the peduncle of the coconut tree (*Cocos nucifera* L. Var typica) for use as reinforcement in polymer composites. The extracted coconut tree peduncle (CTP) fibers were treated with 5% alkali, 6% benzoyl peroxide, 0.5% potassium permanganate, and 1% stearic acid. The chemical composition, surface morphology, mechanical properties, crystallinity, and thermal decomposition of chemically treated CTP fibers were thoroughly investigated. The chemical analysis shows that fibers treated with 0.5% potassium permanganate had a maximum cellulose content of 58.05 wt% after hemicellulose, lignin, and wax were removed from the fiber. This has been due to the chemically treated fiber's improved crystallinity index, crystalline size, tensile strength, kinetic activation energy, and thermal stability. The existence of chemical functional groups is confirmed by Fourier transform infra-red analysis, and major elements such as carbon, nitrogen, and oxygen are quantified by energy dispersive X-ray spectroscopy analysis in chemically treated fibers. The surface of the fibers has become roughened as a result of chemical treatments, as shown by the morphological analysis performed using scanning electron microscopy. Among the chemical treatments tested, fibers treated with 0.5% potassium permanganate demonstrated superior thermo-mechanical properties for use as bio-reinforcement in high performance polymer composites.

KEYWORDS

chemical treatment, coconut tree peduncle fiber, physio-mechanical properties, thermal characteristics

1 | INTRODUCTION

The use of natural fibers in conjunction with polymeric materials in the composite fabrication process has resulted from the increased carbon footprint and compulsion toward sustainable manufacturing. This scenario has prompted researchers to investigate hemp, flax, jute, and sisal fibers for use as an eco-friendly alternative to glass

