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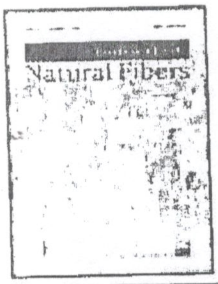

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Characterization of raw and alkali treated new cellulosic fiber from the rinds of Thespesia populnea plant

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ABSTRACT

This current study aims to evaluate the suitability of a new cellulosic fiber by characterization methods. Raw fibers are extracted from the rinds of Thespesia Populnea plant by the water-retting process. The extracted raw fibers are treated with 1% (w/v) of NaOH solution with a soaking time of 90 minutes. The characterization outcomes report that alkali treatment increases the crystalline index and cellulose content from 41% to 65% and 52.5 wt% to 58.9 wt%, respectively. The FT-IR spectra analysis confirms diminishing of non-cellulosic substances in alkali-treated fiber. The alkali treatment alters the fiber surface and fiber diameter, which is evidenced in morphological analysis.

KEYWORDS
Natural fiber; chemical treatment; crystallinity index; thermal stability; Thespesia populnea; morphological analysis

摘要
本研究旨在通过表征方法来评估一种新型纤维素纤维的适用性. 通过水浸法从门杨皮中提取粗纤维. 提取的粗纤维用1%(w/v)的NaOH溶液处理,浸泡时间为90分钟. 表征结果表明,碱处理使结晶指数和纤维素含量分别从41%提高到65%和52.5%到58.9%. 红外光谱分析证实碱处理后纤维中非纤维素类物质减少. 形态分析表明,碱处理改变了纤维表面和纤维直径.

关键词
天然纤维; 化学处理; 结晶度指数; 热稳定性; 门杨树; 形态分析

Introduction

Synthetic fibers (Man-made fibers) usage causes skin irritation to the users, abrasion to the equipment, and also leads to environmental problems. With the intention of reducing the environmental pollution, scientists and engineers have been focusing on alternative sources instead of synthetic fibers. Hence, they are trying to use natural fibers as reinforcement in place of synthetic fibers. Natural fibers have more attractive features like high specific strength and stiffness, low cost, non-abrasiveness, ease of manufacturing, abundant availability, and biodegradability (Buitrago, Jaramillo, and Maryory 2015; Baskaran et al. 2017; Kathiresan et al. 2016; Manimaran et al. 2018; Pandiarajan, Kathiresan, and Sornakumar 2019; Pandiarajan and Kathiresan 2018; Rajesh Jesudoss Hynes et al. 2017; Senthamaraikannan et al. 2018; Thiruchitrambalam et al. 2010). The drawbacks of natural fibers are such as low processing temperature, poor wettability, brittleness, moisture absorption, and incompatibility with polymer matrices (Athijayamani et al. 2009). The hydrophilic property of natural fiber may weaken the adhesion strength between fiber and matrices and also affects the properties of composites (Wang et al. 2007). Various fiber surface modification techniques such as physical (corona discharge, plasma, and U.V. bombardment) and chemical (alkali, grafting, acrylation, permanganate, acetylation, silane, and peroxide) treatment methods (Bozaci et al. 2013; John and Anandjiwala 2008; Thakur et al. 2010) are used to improve the adhesive property of fiber with the matrix. Among these treatments, alkali treatment is a cost-effective and active method to alter the fiber surfaces. The alkali treatment on natural fiber modifies the physical and chemical structure of fiber surface and may also improve the bonding between fiber and matrix

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