Composite materials and structures reinforced with bamboo fibers: A comparative study on the influence of species and age on the fiber physical and mechanical properties

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Abstract

With over 1,500 botanical species of bamboo worldwide, the remarkable rise in the utilization of natural fibers has spurred extensive research into bamboo's potential across various engineering fields. The aim of this study is to examine the influence of bamboo age and species on the physical and mechanical characteristics of the fibers. Three species of bamboo, representing three distinct age groups, were meticulously selected in Cameroon, namely *Bambusa Vulgaris*, *Yushania Alpina* and *Phyllostachys Aureus*. The fibers derived from the three-bamboo species, spanning three distinct age groups, underwent a chemical treatment with a 1% NaOH solution. Subsequently, the fibers were subjected to four comprehensive analyses: tensile testing, thermogravimetric analysis (TGA), Fourier-transform infrared spectroscopy (FTIR), and density measurement. A comparative analysis of the tensile test results reveals that the Young's modulus varies significantly depending on both the age and the species of the bamboo. In contrast, the thermogravimetric analysis (TGA) curves exhibit a striking similarity, regardless of the bamboo's age. The findings of this study will provide designers of innovative materials and engineers with the ability to effortlessly select the appropriate bamboo species and age, tailored to the specific requirements of various applications.

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