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The Effect of Alkaline Treatment to Pseudo-Stem Banana Fibers on the Performance of Polylactic Acid/ Banana Fiber Composite

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Abstract
Banana fiber (BF) is a renewable resource which can be a good reinforcer to polylactic acid, enhancing the polymers stiffness and accelerating biodegradability rates. However, due to the difference in nature between banana fibers (hydrophilic) and polylactic acid (hydrophobic), a good adhesion between the fiber and the matrix cannot be achieved. To tackle the problem, the fibers were chemically treated using sodium hydroxide under three factors (temperature, concentration, and treatment time). The factors interactions were given by response surface methodology and the statistical interactions were observed by ANOVA. Alkaline effect on fiber's morphology, composition, mechanical, and morphological properties of composites produced were observed. Young's modulus values have increased substantially compared to untreated fiber's composites, with a slight increase in the tensile strength values. However, the elongation at break values have slightly dropped with the fiber's alkaline treatment. Scanning electron microscope observations had shown a successful removal of impurities (e.g. hemicellulose, wax) and between the fiber's strands, and an improvement of surface structure. Fourier-transform infrared spectroscopy analysis showed the successful removal of impurities, and interaction between PLA and banana fibers.

Author Keywords
Alkaline treatment; banana pseudo-stem; natural fiber composite; surface modification

Index Keywords
Biodegradability, Fourier transform infrared spectroscopy, Fruits, Morphology, Polyesters, Scanning electron microscopy, Sodium hydroxide, Tensile strength; Alkaline treatment, Banana fibres, Banana pseudo-stem, Fibre composites, Hydrophilics, Natural fiber composites, Performance, Removal of impurities, Renewable resource, Surface-modification; Fibers; Anatomy, Biodegradability, Fruits, Polyesters, Scanning Electron Microscopy, Sodium Hydroxide

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