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Improving the properties of kenaf reinforced polypropylene composite by alkaline treatment

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ABSTRACT

Natural fibre composites are widely utilized to make composite materials like textiles, furniture, cars, and buildings. This is due to the material's qualities, which include lightweight, high strength, and low density. Considering that it can grow in a variety of climates, kenaf fibre is one of the natural fibres that can be used in composite materials. However, the high hydrophilic behavior of kenaf fibre presents a challenge. Consequently, alkaline treatment was used to enhance the kenaf-reinforced polypropylene composite's characteristics. Both extrusion and injection molding were used to produce the composite. A composite without the alkaline treatment was also produced so that the outcomes could be compared. The proportion of used kenaf fibres to polypropylene was 170:30. (g). Thermal analysis, melt flow index (MFI), and water absorption testing was conducted on the composite material. Tensile, flexural, and impact testing were then used to determine the mechanical characteristics of the composite. Scanning Electron Microscope (SEM) and Fourier-Transform Infrared Spectroscopy (FTIR) were used to evaluate the composite. The treated sample's tensile strength was determined to be 0.003 MPa, while the untreated sample's value was 0.002 MPa. Flexural strength increased between the treated sample (6545.49 MPa) and the untreated sample (6405.56 MPa). The treated sample's impact strength was 59.26 J/m as compared to 48.97 J/m for the untreated sample. The results of every test conducted so far have demonstrated that the alkaline-treated composite has better physical and mechanical properties than the untreated.

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1. Introduction

Composite is a material that consists of discontinuous and continuous phases. The discontinuous phase is also called the dispersed phase. The dispersed phase is the phase that is surrounded by a matrix and acts to strengthen the composites. There are three types of dispersed phases which are particle, fiber, and structural. Besides, metal, polymer, and ceramics are the types of matrix phases that are used to transfer stress to the dispersed phase and to preserve the dispersed phase from the environment. In recent decades, natural fibers had comparable strength with synthetic fiber due to their lightweight, abundance, renewable resources, and versatile mechanical properties. Many researchers and industries preferred natural fibers with better properties due to their numerous applications in many fields such as automotive, textile, fiberboard, cushion, paper, mattress, door, wall panel, air cleaner, dashboard, and insulation mat manufacturing, as well as in the construction and transportation industries [1,2].

Natural fibers are made out of cellulose, hemicellulose, lignin, pectins, waxes, and water-soluble substances [3].

Examples of natural fibers are kenaf, hemp, ramie, flax, sisal, coir, jute, bagasse, and wood [4]. Kenaf fiber is more desirable due to its low cost and growth under different atmospheres and climates [1]. The most quickly extending application for kenaf fibers at the show is as reinforcement in composites. Nonetheless, these days, there is interest in this fiber to be utilized as reinforcement for polymers.

In Malaysia, planting, developing, and collecting kenaf plants has turned into the subject of intrigue and is energized by the

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