

Environmentally [illegible]able Natural Fiber Waste Composites: Surface Modification for Superior Mechanical Properties

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Natural fiber-reinforced composites have become a promising alternative to the traditional synthetic fiber-reinforced composites, which are sustainable, biodegradable, renewable and environmentally friendly, with the low density being a key factor. Yet, lack of interfacial adhesion between natural hydrophilic fiber and hydrophobic polymer matrices is still a serious problem affecting the mechanical properties of these composite materials. In this study, this problem is addressed by studying the effects of chemical and radiation treatment of the composite interface on bio-epoxy composites containing coir, jute and abaca fiber wastes. The fibers were treated with 8%, 12%, and 16% NaOH solutions and then gamma irradiated at 1, 2, 3, 4, and 5 kGy. The results showed that the tensile, flexural, and impact properties were improved as the alkali concentration increased as a result of the removal of amorphous constituents and increased fiber surface roughness, leading to better fiber–matrix interactions. The gamma irradiation also enhanced the mechanical performance up to 2kGy. Above this amount, the excessive amount of irradiation degraded the fibers, leading to a dramatic decrease in composite properties. The results obtained by the Scanning Electronic Microscopy (SEM) analysis showed that the optimum treatment condition resulted in better bonding between the fiber and the cement, which also minimized fiber pull-out, while higher radiation doses caused microstructural

damage. The results show the significance of the controlled parameters on surface treatments and the improvement of composite performance.

Keywords: ABACA FIBER; COIR FIBER; GAMMA RADIATION; JUTE FIBER; MECHANICAL PROPERTIES; SEM ANALYSIS

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