

Natural Fiber Based Green Composites: Sustainable Materials for Future

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The growing demand for sustainable materials has accelerated the development of natural fiber reinforced polymer composites as alternatives to conventional synthetic composites. This work explores **Kans grass (*Saccharum spontaneum*)** as renewable reinforcements in epoxy-based green composites. Kans grass fibers were extracted by water retting and treated with different concentrations of NaOH to improve interfacial bonding and mechanical performance. The fibers and composites were characterized using mechanical, thermal, morphological and spectroscopic techniques. The optimized alkali treatment improved fiber tensile strength by approximately 24%, while selected Kans grass–epoxy composites demonstrated comparable tensile and flexural properties with improved thermal characteristics. The study further discusses **nanofiller-assisted enhancement** of natural fiber composites through case studies involving **nanoclay, nano-SiO₂, nano-TiO₂, carbon nanotubes and nano-graphene**. These studies demonstrate improvements in mechanical, thermal and water-barrier properties through suitable nanofiller incorporation. The work highlights the potential of natural fibers combined with nanotechnology for developing lightweight, sustainable and high-performance engineering materials.