Effect of Graphite on Mechanical Thermal and Morphological Properties of Kenaf Recycle Polypropylene Wood Plastic Composites

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Abstract:
The objective of this research is to investigate the effect of incorporating graphite filler on mechanical, thermal and morphological properties of wood recycled plastic composites (WrPC). WrPC was prepared using recycled polypropylene (rPP), kenaf core, maleic anhydride polypropylene (MAPP) and graphite filler. The graphite content in WrPC is 3 phr. All materials were premixed manually and fed into a single screw extruder and compression molded to prepare mechanical test specimens. The effect of graphite on tensile properties, impact strength, glass transition temperature (Tg) and morphological properties of WrPC were studied. Tensile strength was increased from 6.81 MPa to 10.07 MPa due to stronger interfacial adhesion between graphite and kenaf/rPP. However, the tensile modulus decreased significantly with the incorporation of graphite. Impact strength of WrPC was increased from 2.48 kJ/m2 to 2.83 kJ/m2 due to the present of graphite that gave effective distribution of applied stress and increase resistance of crack propagation. DSC results indicated that Tg of graphite/WrPC is comparable to WPC at 163°C. The internal structure of WrPC showed the addition of graphite had filled the voids and lead to smooth morphology.

Keywords: Composites; Graphite; Kenaf; Recycle PP

References

1. Madsen, B. and E.K. Gamstedt, Wood versus Plant Fibers: Similarities and Differences in Composite Applications. Advances in Materials Science and Engineering, 2013: p.14. DOI: 10.1155/2013/564346
2. Li, L., W. Guo, and C. Guo, Synergistic effect of melamine polyphosphate and aluminum hypophosphite on mechanical properties and flame retardancy of HDPE/wood flour composites. Wood science and technology, 2017. 51(3): pp.493-506.DOI: 10.1007/s00226-016-0877-2
3. Partanen, A. and M. Carus, Wood and natural fiber composites current trend in consumer goods and automotive parts. Reinforced Plastics, 2016. 60(3): pp.170-173.DOI: 10.1016/j.repl.2016.01.004
4. Klyosov, A.A., Wood-plastic composites. 2007: John Wiley & Sons.
5. Sommerhuber, P.F., J. Welling, and A. Krause, Substitution potentials of recycled HDPE and wood particles from post-consumer packaging waste in Wood–Plastic Composites. Waste management, 2015. 46: pp.76-85. DOI: 10.1016/j.wasman.2015.09.011