

Effect of surface treatment on mechanical, physical and morphological properties of oil palm/bagasse fiber reinforced phenolic hybrid composites for wall thermal insulation application

ABSTRACT

The effect of 2%v/v silane and 4%v/v hydrogen peroxide treatment on mechanical, physical and morphological characterization of oil palm empty fruit bunch (OPEFB) and sugarcane bagasse (SCB) fiber reinforced bio-phenolic hybrid composites has been evaluated in this work. The treated OPEFB and SCB fibers has been prepared with different ratio while maintaining 50%wt fiber loading, and then incorporated with the bio-phenolic resin by hand layup technique to produce pure and hybrid composites. Universal testing machine INSTRON has been used for tensile, flexural, and compressive strength analysis. Water absorption and thickness swelling are determined after 24 h. Fracture behaviour, void and fiber pull out of the specimen was observed by using scanning electron microscope in morphological analysis. The hybridization of silane treated 7OPEFB:3SCB fiber indicates better highest performance on tensile strength and modulus with 11.67 MPa and 1348.43 MPa. The silane treated 5OPEFB:5SCB hybrid composites show highest flexural and compressive strength, 16.82 MPa and 6.53 MPa, respectively. Obtained result showed silane treated 3OPEFB:7SCB hybrid composites displays lowest water absorption and thickness swelling after 24 h analysis and show less void content. This study indicated that 2%v/v silane coupling agent gives better enhancement of mechanical properties compared to 4%v/v hydrogen peroxide treatment. Silane treated 5OPEFB:5SCB fiber reinforced bio-phenolic hybrid composites fulfil requirement of the mechanical and physical properties needed for insulation board as per standard. It can be concluded from this study that silane treatment improve the performance of agriculture residue and the hybridization of bio-composites have potential to develop new class of eco-friendly thermal insulation and sustainable wall building materials.

Keyword: Oil palm empty fruit bunch; Sugarcane bagasse; Silane; Hydrogen peroxide treatment; Tensile; Hybrid composites