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Mechanical and Microstructural Properties of Hybrid Bio-Composites using Microwaved Coconut Fibre and Rice Husk

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Abstract

The outstanding mechanical and environmental qualities of hybrid bio-composites have made them popular. The drying procedure to remove the moisture before manufacture, on the other hand, can take a long period. By modifying the macromolecular structure considerably faster, hybrid bio-composites with additional physical treatment utilising microwave energy could improve their mechanical capabilities. Fillers of 80:15:5, 90:5:5, and 98:1:1 coconut fibre and rice husk were combined with poly-lactic acid (PLA) utilising melt-mixing and hot press techniques. The fillers were dried in a conventional oven at 60°C for 24 hours and in a microwave oven at 2.45 GHz for 3 minutes. When tensile strength was tested, it was discovered that oven-treated fibres with a 98:1:1 composition had a higher tensile strength (63 MPa) than microwave-treated fibres (58 MPa). Microwave-treated fibres, on the other hand, had a higher flexural strength (69 MPa) than those treated in a normal oven (60 MPa). Furthermore, when compared to plain PLA, microwave energy enhanced the toughness of the bio-composites by at least 4%. For the 80:15:5 composition, microwave-treated fibres had a lower water absorptivity (2%) than conventionally treated fibres, which had a water absorptivity of 5%. SEM images confirmed the presence of agglutination and voids with higher fibre content, resulting in poor adhesion and low tensile and flexural strength.

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