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Review of Experimental Investigation on Mechanical Properties of Wood Flour Reinforced Composite Material

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A B S T R A C T

We had learned about composite material and its mechanical properties by reviewing journals. In this experimental and investigation is to analyze the mechanical properties of the wood powder/flour with epoxy resins. The different combinations of fiber and resin composites are prepared. The natural fibers are cheaper, Eco-friendly. Natural fibers are the most popularly used fibers in natural composites. In this study epoxy resin is chosen as matrix and wood powder/flour is chosen as reinforcement. These composites are majorly used in wood products, automobile, aerospace, marine and domestic applications. Mechanical, physical, chemical and thermal properties are analyzed and used for various applications.

Keywords: wood powder/flour, Resin, mechanical properties, and Natural fibres.

1. LITERATURE REVIEW

Nithin Kumar Jain et al. [1] It is observed that the Epoxy resin is the most widely used thermosets polymers containing the advantages such as easy processing as compared to thermoplastics, strong bonding, high tensile and compressive strength, long durability, good thermal stability and good chemical resistant. Among all wood composites, the greatest mechanical performance and thermal stability was exhibited by hybrid wood composites T50S50. Highest value of glass transition temperature and load bearing capacity was shown by hybrid wood composites T50S50. Among all wood composites, hybrid wood composites T50S50 offered overall better performance.

Figure -1 Notations for hybrid wood composites.

Composite	Teak Wood Content (%)	Sal Wood Content (%)	Total Wood flour content (Weight%)	Total matrix (Weight%)
T0S100	0	100	33	67
T25S75	25	75	33	67
T50S50	50	50	33	67
T75S25	75	25	33	67
T100S0	100	0	33	67

H. P. S. Abdul Khalil et al.[2] it is observed that the Wood flours were prepared for four sizes: mesh no. 35, 60, 80, and 100. The average moisture content of the AM flour was about 7%. The wood flour was mixed with PP in a Haake Rheodrive 5000 (drive unit) and Haake Rheomix 600 with roller blade (mixer). The filler and PP pellets were hand mixed prior to placing them in the mixer. The mixing was carried out at 1808C, from feeding zone to the die zone. The properties of the composites were effected by modification of the wood flour. Composites made from modified wood flour exhibited improved mechanical and WA properties.

Van Dinh Nguyen et al.[3] Three tree species commonly used in Vietnam were investigated to reinforce HDPE by studying the weather resistance properties of their composites. UV weathering resistance of the composites is affected by the type of WF used. FTIR analysis demonstrated that there were significant changes in the surface chemistry of the composite material after exposure. After 1000 h, there was an increase in characteristic peaks of C=O and lignin, while that of cellulose decreased; The flexural properties and impact strength of the composites declined between 0 and 2000 h of aging. Among the three composites, A. mangium/HDPE exhibited the highest flexural property and impact strength over 2000 h UV weathering. In addition, the degree of color change of the composite was the lowest.

R. Mat Taib et al.[4] The water uptake for PP and AEF–PP composites with and without MAPP as a function of immersion time in hours. Each data point represents the average of six specimens. The PP as seen in the figure, exhibits a negligibly small amount of water uptake after 3 months of water exposure at room temperature. This is explained by the hydrophobic nature of the material. As for AEF–PP composites, large amounts of water uptake are observed.

This study examined the effect of water absorption on the tensile properties of AEF–PP composites. The tensile properties were adversely affected by water absorption. Similarly, AEF–PP–MAPP composites were also affected.

R. O. Medupin et al. [5] The wood waste filler particle content increases, the composite becomes more stiff and less ductile. It is evident that as the particle content is increased beyond 60% reinforcement, the particles may not interact with the polymer matrix and the interfacial adhesion that is responsible for the composite stiffness and strength would be much lower as the particles agglomerate. This work relates to wood waste as a reinforcing filler in LDPE (Low density polyethylene) The wood particles that have high strength and high modulus coupled with good adhesion and uniform dispersion into the matrix material give the better mechanical properties compare to the unreinforced polymeric material. Microstructural studies have revealed that there is a good dispersion of the filler into the polymer matrix. Composite fabrication for a specific application requires the appropriate filler material and to include optimizing its content in the composite system.

Nicole Stark [6] The results of our study indicate that incomplete encapsulation of wood flour by the polypropylene (PP) matrix occurs in both 20% and 40% wood flour composites; less encapsulation occurs with the higher wood flour content. Thus, more moisture is absorbed by the wood flour at higher filler levels, which in turn may decrease mechanical properties. A composite with 20% wood flour absorbs a maximum of 1.4% moisture. This amount of absorption is not enough to significantly affect mechanical properties; flexural, tensile, and impact properties are not changed. For a composite with 40% wood flour, up to 9.0% moisture is absorbed. The PP affords less protection to the wood flour filler, and moisture is absorbed more rapidly and to a greater extent. This results in a decrease of tensile and flexural properties in the most extreme case, the water soak. A decrease in flexural properties also is observed for 40% wood flour composites exposed to 90% RH and 26.7°C (80°F). The decrease in strength may be due to a degradation of the interface between the PP and WF, while the decrease in modulus could be a result of the decrease in modulus of the wood upon moisture absorption. Unnotched impact energy remained unchanged upon exposure to moisture, while notched impact energy decreased only at the 40% filler level for specimens exposed to the water soak

Mehdi Malakani et al.[7] By reaction of vinyl acetate with fir sawdust flour under experimental conditions of this study, a weight gain of 18.8% was observed. The obtained results showed that increasing of the MAPP coupling agent content reduced the water absorption and thickness swelling in all samples, including decayed and non-decayed ones.The results revealed that the acetylation reduced water absorption and thickness swelling in all the samples.It was shown by the results that the increase of the coupling agent percentage reduced the percentage of weight loss, while the acetylation caused a smaller weight loss in the composite samples. It was shown that an increase of the MAPP coupling agent led to greater contact angles of water. A similar effect on water contact angle resulting from acetylation of the wood flour. The SEM micrographs showed that increasing the coupling agent improved the strength of the bond between the fibers and the polymer material. The positive effect of acetylation was attributable to its role as a compatibilizer.

Fauzi Febrianto et al.[8] Immersing the strands of A. mangium inhot water at 80° C for 2 hours prior to manufacture OSB improved the MOR. MOE and IB values of OSB. Increasing the adhesive content from 3 to 5% improved the dimensional stability (WA and TS) and mechanical (MOR, MOE and IB) properties of OSB prepared from pretreated A. mangium wood strands in hot water at 80°C for 2 hours. Utilization of treated strands in hot water at 80°C for 2 hours for OSB manufacturing reduced the consumption of adhesive used.

2. CONCLUSIONS

From these journals, we learned some information regarding mechanical properties such as Tensile Strength, Compressive Strength, Flexural Strength, Impact test, Water absorption test of natural wood/flour with epoxy resin are analyzed and calculated. The present hybrid wood composite can be proposed for industrial applications such as automobile interior parts, construction and building, households, and packaging because of its better performance than single wood composites. More over to that because of its toughness, hardness and light in weight it can be used in maximum of mechanical parts.

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