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Research on Composite Tile Reinforced by Rice Husk

Mohamad Zaidi bin Ahmad Yusoff [a1], Mohd Naim bin Hamid [a2]
Khalida binti Khairudin [a3]

[a1,a2,a3] Jabatan Kejuruteraan Mekanikal, Politeknik Ibrahim Sultan, km 10. Jalan Kong Kong, 81700 Pasir Gudang, Johor
[a3] Jabatan Rekabentuk dan Komunikasi Visual, Politeknik Ibrahim Sultan, km 10. Jalan Kong Kong, 81700 Pasir Gudang, Johor

[a1]zaidi@pis.edu.my, [a2]naeim@yahoo.com, [a3]khalida@pis.edu.my

Abstract

Rice husk ash is a high quality agricultural waste of silica content, it is also a waste that has been burned from the produced in the rice processing industry to rice manufactured rice processing but most rice husk in Malaysia are often open burned and waste disposal. The residue of rice husk ash is simply removed due to environmental pollution, waste disposal. Therefore, this innovation produces rice husk ash tiles study aims to reduce environmental pollution and disposal of rice husk ash with new innovation of rice husk ash tiles. In conclusion, this rice husk ash tiles can reduce environmental pollution while reducing the disposal of rice husk ash. There types of tests have been carried out in order to produce this rice husk ash tiles. Tensile Test to obtain the maximum rate of tension for each composition of test material performed. So, to choose right ratio of sample for prevent the tiles easily break. Water absorbed tests also been conducted to determine the amount of water absorption received for each material composition with different ratios and to ensure the sample ratio is suitable for producing tiles. The 60:40 ratio of sample, it suitable to produce tiles for wall or floor. Result of average maximum Stress of ratio sample 60:40 is 5.14 while average load is 1.73N needed to break the sample. Water Absorption for 60:40 sample is 0 % which mean it is waterproof and suitable to produce tiles for wall and floor.

Key-word: - Rice husk, Rice husk ash

1. Introduction

Rice is the third largest global food crop. Rice has been a staple food of the Malaysian community and the paddy/rice industry is considered as a strategic industry and always gets special treatment from the government. It is vastly grown on the Malaysian peninsular. Land utilization for paddy production is currently at 674,928 hectares which is 76 percent in Peninsular Malaysia while Sarawak and Sabah accounted for 18 percent and 6 percent of the total hectare age respectively. Rice husk is the by-product in rice milling operation with an approximately 20 percent of the total weight of the paddy grain being processed (Nurul Nadia Ramli et al., 2012).

Despite the abundant nature of this waste products its unique physical chemical properties (Petal P.M., 2005). Only a little portion of the rice husk produced is utilized in a meaningful way, the remaining part is burnt into ashes or dumped as solid waste with little being used in particleboard formulation. Rice husk ash is an agricultural waste that is readily available and in large quantities. Rice husk ash utilization in this way is a waste to wealth project, since husk ash is not being in serious commercial/industrial usage. Rice husk ash particleboard is therefore one such material which may be considered as potential substitutes for wood wood-based board products (Petal P.M., 2005).

Figure 1 Rice Husk

Figure 2 Rice Husk Ash

2. Problem Statement

Rice husk is generated from rice processing industries as a major agricultural by-product in many parts of the world, especially in developing countries. Rice husk is presently disposed of mostly by open burning (Rosmiza et al., 2017). Open burning of rice husk causes release of air pollutants, which contributes to enhance climate change related issues. The burning practice was a reason of losing carbon content from crop land to the atmosphere. Carbon losses to the atmosphere through field burning were then estimated (K. Kanokkanjana and S. Garivait, 2013). The ash obtained by burning this rice husk is known as Rice Husk Ash (RHA). Still now, there is no effective or useful application of RHA and is usually dumped into water (M.R. Karim, 2011). Therefore, this innovation produces rice husk ash tiles study aims to reduce environmental pollution and disposal of rice husk ash with new innovation of rice husk ash tiles.

3. Objective

i. Innovate tile from rice husk ash with epoxy resin.
ii. Determine mechanical and physical properties of composite rice husk.

4. Scope

i. Produce composite material from mixture of rice husk ash and epoxy.
ii. Determine the strength and toughness properties through a tensile test and impact test.
iii. Identify the water absorption and density of composite.

5. Literature Review

Based on a study conducted by BERNAS, Department of Agriculture and MARDI, the composition of one kilogram of rice in Malaysia is reported to be 5% per kg. An estimated 600 million tons of rice is produced annually worldwide. Rice husk is an ingredient in the process of producing rice and is very useful in several industries.

Rice husk was subjected to various tests to determine its chemical composition properties. In the process, the liquid limit content of the rice husk ash was established. Compressive strength machine was used to determine the strength of the rice husk concrete. Defeasibility test was also carried out to determine the thermal conductivity of the rice husk. Rise husk has some organic substance which makes it difficult to bind effectively with cement (Onyemachi, 1997). The reason behind the use of rise husk in the construction industry are its high availability, low bulk density (90-150kg/m^3), toughness, abrasive in nature, resistance to weathering unique composition (Johnson AC, Yunus YBDN, 2009).

Adhesive is a compound that adheres or bonds particles together. Adhesives are produced from either natural or synthetic sources. Some adhesives produce extremely strong bonds are becoming increasingly important in the modern construction industry. Adhesive are essential extensively used in wood-based composite products. Adhesive type cure schedule vary according to the composite application. Adhesive used in the manufacture of particleboard should be flexible soft to respond to the dynamic effects of swelling shrinkage, yet impart the required strength (Johnson AC, Yunus YBDN, 2009).

6. Metodology

6.1 Rice Husk Ash

Rice husk ash are the hard protecting coverings of grains of rice. In addition to protecting rice during the growing season, rice hulls can be put to use as building material, fertilizer, insulation material, or fuel. Rice hulls are part of the chaff of the rice.

6.2 Epoxy

Epoxy refers to any of the basic components or cured end products of epoxy resins, as well as a colloquial name for the epoxide functional group.[1] Epoxy resins, also known as polyepoxides, are a class of reactive prepolymers and polymers which contain epoxide groups. Epoxy resins may be reacted (cross-linked) either with themselves through catalytic homopolymerisation, or with a wide range of co-reactants including polyfunctional amines, acids (and acid anhydrides), phenols, alcohols and thiols (usually called mercaptans). These co-reactants are often referred to as hardeners or curatives, and the cross-linking reaction is commonly referred to as curing.

6.3 Procesess

Figure 3 shows the work process of composite production

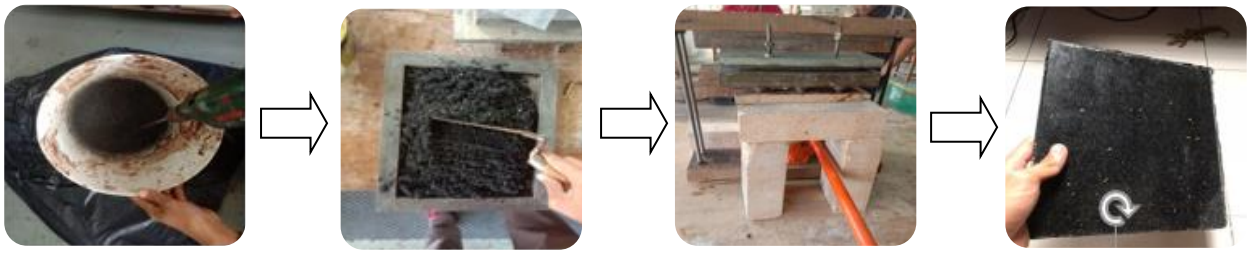


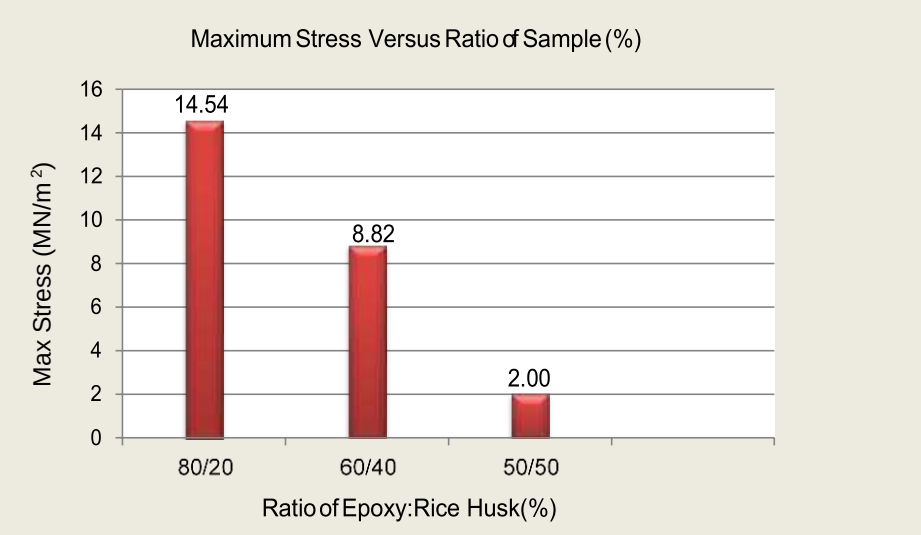
Figure 3 Work Process of Composite Production

7. Findings

7.1 Tensile Test

The average maximum stress is 14.54 MN/m2 which is in the samples 80% of epoxy and 20% of fibre. This indicates that the sample need highest stress compared to other samples. Meanwhile, the average maximum stress is a minimum of 2.00 MN/m2 in 50% of epoxy and 50% of fibre rice husk ash samples.

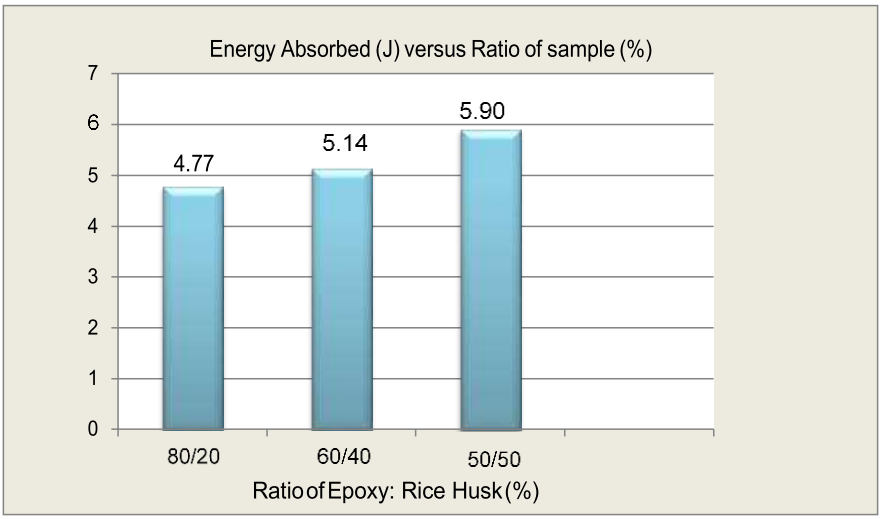
Table 1 Results of Tensile Test



7.2 Tensile Test

The maximum average energy absorbed is 5.90J which is in the 50% sample of Epoxy. This indicates that the sample has a lot of energy absorbed by the material compared to other samples. Meanwhile, the average charpy is a minimum of 4.77 J in 80% sample of Epoxy

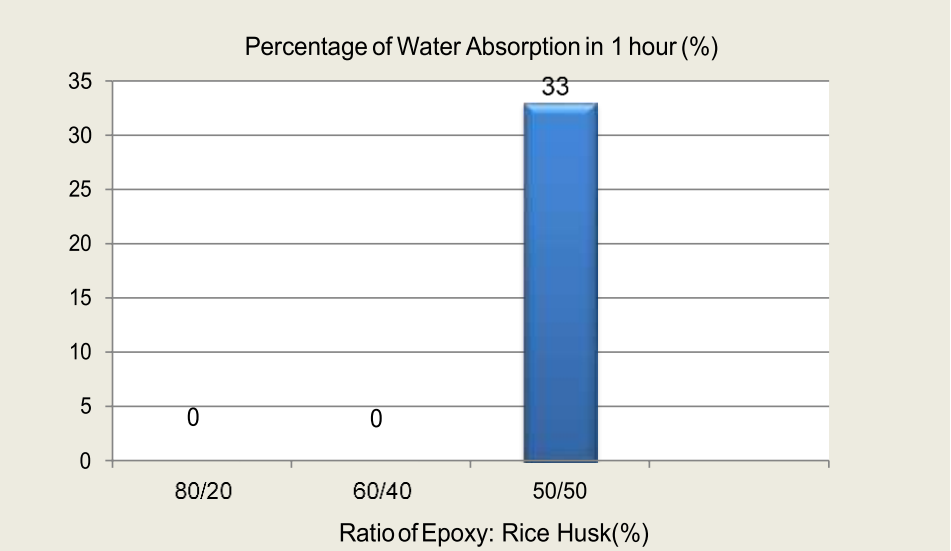
Table 2 Results of Impact Test (Charpy)



7.3 Water Absorption Test

The highest percentage absorption is 33% which is absorbed at a ratio off 50% of epoxy and 50% of fibre. At ratio 80% of epoxy 20% of fibre and 60% of epoxy 40% of fibre, no water absorption occurs on the sample because the ratio uses 80% and 60% epoxy resin with epoxy hardener which is a very strong material and not absorbed by water.

Table 3 Results of Water Absorption Test



8. Conclusion

Rice husk has already proven to be excellent alternative natural fiber in composite. The 60:40 ratio of sample, it suitable to produce tiles for wall or floor. Result of average maximum Stress of ratio sample 60:40 is 8.82 MN/m2 while average energy absorbed is 5.14J needed to break the sample. Water Absorption for 60:40 sample is 0 % which mean it is waterproof and suitable to produce tiles for wall and floor**.**

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