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Materials Fabricated From Raffia Palm Leaves for Roofing and Ceiling Applications – Advantages over the Local Unmodified Raffia Palm Roofing Sheets

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Abstract

We report the on-going research on raffia palm leaves. Various aspects of the leaves have been highlighted. The disadvantages of using the leaves in its raw (local) form are discussed. We also enumerate the advantages of the research work; the modified form of roofing sheets. The processed form of the raffia palm leaves are found to be of enormous economic importance and value.

Keywords: Local roofing sheets (mats), Processed specimen.

1.0 Introduction

In a recent paper (Ndukwe, 2007), the author fabricated samples from raffia palm leaves and carried out certain characterizations which include bulk density, hardness, surface structure, and thickness on them. Their possible applications for roofing, ceiling, and other purposes were proposed. The abundance of the raffia palm trees in the tropics had been highlighted making the research very viable and absolutely necessary.

It was observed that enormous economic importance, advantages or benefits would accrue from the processing of the raffia palm leaves as outlined in Ndukwe (2007). This is particularly important as much emphasis has been placed on research on local materials for building and other purposes in order to save foreign exchange and contribute positively to the nation's economy.

In this research note, we further report the results obtained in the modified form of local roofing sheets produced from raffia palm leaves. Some advantages of using raffia palm roofing mats are mentioned but the great disadvantages of roofing buildings with them in their natural raw state vis-à-vis the processed modified raffia palm roofing sheets envisaged from the fabricated specimens are discussed.

2.0 Highlights

In this section, certain aspects of raffia palm leaves are highlighted with a view to creating a good understanding of the local raw materials. In Plate 1, a raffia palm tree standing alone is shown displaying the setting of the raffia palm leaves and leaflets on the tree. Plate 2 is a group of trees (together). These are found in great abundance in the tropics making it a ready source of raw materials. Plate 3 displays single leaflets still green (wet) and a mat in the making while Plate 4a shows two mats made from wet leaflets while the two mats of Plate 4a now dry are shown in Plate 4b. It is from the wet leaflets that the roofing mats are formed by bending each across two parallel equal rods and joining them together systematically by pinning at each stage with flat tiny pegs also made from the leaf-stalk (see Plate 3). A stack of about seven wet local roofing mats (sheets) is shown in Plate 5 while Plate 6 shows a stack of about twenty-five dry sheets. Plates 7a and 7b display local houses with fresh local roofing sheets while a local house with old tattered roofing sheets is shown in Plate 8 exposing the ugliness of the roof after a short while of roofing.

3. Disadvantages of the Raw Local Roofing Sheets

From Plates 6 to 8, it can be noted that the local roofing sheets in their raw state have a lot of disadvantages which greatly reduce the influence of the major advantage of their cooling effect inside buildings roofed with them.

From the size of the stack shown in Plate 6, it is ob-

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Plate 1: Raffia palm tree standing alone.

Plate 2: A group of raffia palm trees (together).

Plate 3: Wet green raffia palm leaflets and a mat in the making.

Plate 4a: Two mats from wet leaflets.

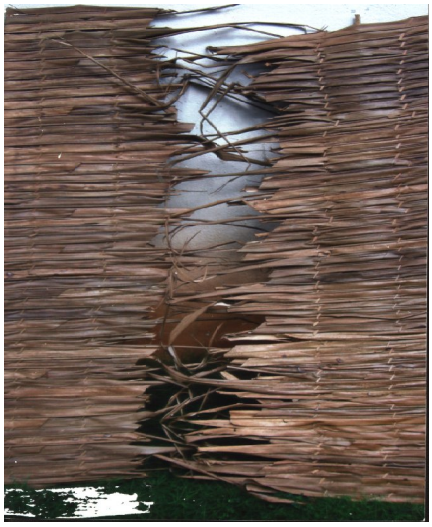

Plate 4b: The two mats of Plate 4a now dry

Plate 5: A stack of about seven wet local roofing mats (sheets).

Plate 6: Astack of twenty-five dry local roofing sheets.

Plate 7a: Local house roofed with fresh local roofing sheets.

Plate 7b: Another house roofed with fresh local roofing sheets.

Plate 8: Local house with old tattered local roofing sheets.

Table 1: Parameters of specimens fabricated from 250μm grain size in small mould.

Mass (m) $\pm 0.05 \times 10^{-3}$(Kg)	Thickness (t) $\pm 0.01 \times 10^{-3}$(m)	Bulk Density (ρ) $\times 10^{2}$(Kgm^{-3})	Hardness (HRC)
4.00	5.60	13.98 ± 0.22	98
6.00	8.82	13.31 ± 0.15	94
8.00	11.13	14.06 ± 0.12	95
10.00	13.33	14.68 ± 0.11	79
12.00	16.62	14.13 ± 0.09	47
14.00	20.00	13.70 ± 0.08	46
16.00	22.25	14.07 ± 0.07	75

served that it is not easy to transport a large number of sheets conveniently from one point to another. Plates 7 and 8 reveal that they have very low durability. The gap in time between Plates 7 and Plates 8 may be just one year after which it starts leaking heavily during the rains. It is also less versatile in its applications. These and other disadvantages prompted the research into the processing, fabrication, and characterization of specimens from raffia palm leaves for proposed roofing and ceiling applications as outlined in Ndukwe, 2007. Some of the parameters of the specimens fabricated in that research are given in Tables 1-5.

4.0 Economic Importance and Advantages of Modified Raffia Palm Roofing Sheets

The disadvantages listed in section 3 for the raw local roofing sheets give way to a lot of advantages of the newly invented specimens which will give rise to the modified raffia palm roofing and ceiling sheets (Akujor, 2007).

One of the advantages is the very easy transportability. This can be readily seen in the light of bulk density range of between 13.31 x 10^2kgm^{-3} and 15.92 x 10^2kgm^{-3} for the prepared specimens

Table 2: Parameters of specimens fabricated from 175μm grain size in small mould.

Mass (m) ±0.05 x 10^{-3}(Kg)	Thickness (t) ±0.01 x 10^{-3}(m)	Bulk Density (ρ) x 10^2(Kgm^{-3})	Hardness (HRC)
4.00	5.53	14.15 ± 0.22	98
6.00	7.81	15.03 ± 0.17	98
8.00	11.10	14.10 ± 0.12	98
10.00	13.40	14.60 ± 0.11	96
12.00	16.63	14.12 ± 0.09	87
14.00	19.90	13.76 ± 0.08	98
16.00	22.24	14.08 ± 0.07	86

Table 3: Parameters of specimens fabricated from 150μm grain size in small mould.

Mass (m) ±0.05 x 10^{-3}(Kg)	Thickness (t) ±0.01 x 10^{-3}(m)	Bulk Density (ρ) x 10^2(Kgm^{-3})	Hardness (HRC)
4.00	5.52	14.98 ± 0.23	98
6.00	7.78	15.09 ± 0.17	95
8.00	10.05	15.57 ± 0.14	94
10.00	12.29	15.92 ± 0.12	99
12.00	15.67	14.98 ± 0.10	98
14.00	17.76	15.42 ± 0.09	97
16.00	22.19	14.11 ± 0.07	96

Table 4: Parameters of specimens fabricated from 250μm grain size in small mould.

Mass (m) ±0.05 x 10^{-3}(Kg)	Thickness (t) ±0.01 x 10^{-3}(m)	Bulk Density (ρ) x 10^2(Kgm^{-3})	Hardness (HRC)
5.00	6.70	14.60 ± 0.19	55
10.00	13.33	14.68 ± 0.11	98
15.00	20.09	14.61 ± 0.08	67
20.00	27.73	14.11 ± 0.06	50
25.00	33.33	14.68 ± 0.06	47

Table 5: Parameters of specimens fabricated from 150μm grain size in big mould.

Mass (m) ±0.05 x 10^{-3}(Kg)	Thickness (t) ±0.01 x 10^{-3}(m)	Bulk Density (ρ) x 10^2(Kgm^{-3})	Hardness (HRC)
5.00	4.49	14.57 ± 0.20	99
10.00	8.84	14.81 ± 0.11	95
15.00	13.37	14.68 ± 0.08	86
20.00	18.84	13.89 ± 0.06	89
25.00	21.19	15.44 ± 0.06	92
30.00	25.58	15.35 ± 0.05	99
35.00	30.04	15.25 ± 0.05	93
40.00	34.45	15.20 ± 0.04	84

as seen from Tables 1 to 5. It is also hoped that when the specimens are subjected to weather conditions, they will be very durable. Another great advantage of the specimens is that they will be very versatile in their applications in the sense that they could be used for roofing, ceiling, for partitioning, etc.

The economic importance of this specimen fabrication cannot be overemphasized. Firstly, when the process of production is industrialized and commercialized, it will create job opportunities and thus employ a lot of manpower. Again, the development of efficient local materials for building purposes will save a lot of foreign exchange and, when fully developed, may even attract foreign exchange through export. These and more will add great value to the use of raffia palm leaves.

5.0 Conclusion

The raffia palm tree is a utility plant with every part of it used locally for various reasons. The efforts by the author to conduct research on the leaves are continued here. Some aspects have been highlighted. The disadvantages of the use of the leaves in thelocal raw form for roofing purposes have been discussed while the advantages of the researched modified raffia palm roofing sheets have been stated.

The processed form of the raffia palm leaves were found to be of enormous economic importance and value adding. Further research is being carried out by the author in certain areas such as in the addition of binders e.g. Polyvinyl acetate and further characterizations such as brittleness and porosity tests, etc.

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