J. Solid St. Sci. & Technol. Letters, 2015, Vol. 16 No. 1-2 , pp. 36-39
http://letters.masshp.net/ | ISSN 0128-8393

SAGO FIBER CLAY FOR ARTWORK

Wan Samiati Andriana Wan Mohammad Daud[1], Margaret Chan Kit Yok[2], Norazlin Abdullah[3], Susana William Jalil[4] and Safrina Muhammad Azmi[5]*

[1] Faculty of Art and Design, Universiti Teknologi MARA Sarawak, Jalan Meranek, 94300 Kota Samarahan, Sarawak, Malaysia

[2]Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Sarawak, Jalan Meranek, 94300 Kota Samarahan, Sarawak, Malaysia

[3]Faculty of Sport Sciences and Recreation, Universiti Teknologi MARA Sarawak, Jalan Meranek 94300 Kota Samarahan, Sarawak, Malaysia

[4] Faculty of Business Management, Universiti Teknologi MARA Sarawak, Jalan Meranek 94300 Kota Samarahan, Sarawak, Malaysia

[5]Faculty of Art and Design, Universiti Teknologi MARA Sarawak, Jalan Meranek 94300 Kota Samarahan, Sarawak, Malaysia

ABSTRACT

This study investigates the potential of sago fiber clay as a new medium for ceramic artwork produced from sago byproduct and ceramic clay. Sago clay not only provide innovative materials for artists, but also enhanced the use of materials otherwise considered as waste. A total of seven test bars of each measuring 25 mm x 25 mm x 150 mm material with the different fiber ratios and a base clay body with no fiber added were prepared by pressing into a one-sided plaster mould. The sago fiber clay was pressed by hand and the open surface was smoothened with a splint which was later fired in 3 range of temperature stated; 1000^oC, 1100^oC and 1200^oC. The sago clay samples were then glazed with transparent glaze. The findings shows that sago fiber clays could withstand high temperature and were resistance to cracking. This properties made it a possible medium for a new type of clay for artwork.

Sago or scientifically known as *Metroxylan Sagu* is a species of palm in the genus Metroxylan, native to tropical south-eastern Asia, Indonesia and Papua New Guinea, Malaysia and Philippines. Sarawak has a long tradition of sago industry and over the years, it has contributed extensively towards the socio-economic development of Sarawak. The local uses the barks of the trunk as timber fuel, wall materials, ceilings and fences. Expectantly, sago bark can be processed as well as recycled into kraft paper through low technology and simple procedures. Sago bark is one of the wasted materials in the sago production industries. It is also described as hard white starchy grains [1]. The local Sarawak uses the barks of the trunk as timber fuel, wall materials, ceilings and fences. Fiber of extracting sago flour is used as animal feed. It is estimated that the present area under sago in Sarawak is 19,720 hectares, located mainly in the Sibu Division [2]. The five major areas include Oya-Dalat, Mukah, Pusak-Saratok, Igan and Balingan. There are about 1.69 million hectares of peat soil in Sarawak that are considered suitable for sago cultivation. Hence, the scope for the expansion of sago cultivation appears to be bright, [3]. According to [4], sago bark is one of the waste materials in the sago production industries. A technology has been developed by [5] to produce acid free, eco-friendly and bio-degradable kraft paper from sago fibers and barks to ease the waste problem emitted by the sago factories in Mukah and Pusak areas, Sarawak, East Malaysia. It is described that ceramic products as ceramic materials [6], mainly derived from clay, used alone were brittle and hence produced fragile components which could easily be broken; however, they resisted cracking if they contained fibers. Paper clay known as fiber clay was introduced to the field of ceramic art by several potteries and material chemists in the 1990s [7-12] which enabled new ceramic techniques that have aesthetical value. The possibility that sago waste which has very high content of fiber can be an alternative to paper fiber in paper clay used for ceramics artwork due to the bonding between fibers and matrix created during the manufacturing phase of the composite material, has a fundamental influence on the mechanical properties of the composite material [13]. In addition, the cellulose fiber added, obtained a translucent effect and paper pulp added, increased its dry strength and achieved a lightweight clay body [14]. The two of the main component, improvement in the low green strength and plasticity in the sago fiber was observed in which, the best material was waste paper combined with porcelain as it was easy to mix, resulting in a lightweight material and had virtually the same appearance as ordinary porcelain.

J. Solid St. Sci. & Technol. Letters, 2015, Vol. 16 No. 1-2 , pp. 36-39
http://letters.masshp.net/ | ISSN 0128-8393

Raw materials collected from a sago factory in the Pusak area in Sarawak, Malaysia were soaked overnight in hot water with salt being added as preservatives to prevent the production of unpleasant odors and growth of mold. After being washed, the raw materials were divided into 2 samples. First sample was bleeched to obtain a white fiber stock by using a commercial bleecher clorox. The second sample was untreated and left as unbleached sago fiber stock. Both stocks were dried and later grinded into finer fiber. Five hundred liters of water will was added into the sago fiber and homogenized to produce a pulp. The pulp is then mixed with clay shreds and kneeded to produce the sago fiber clay body which can be hand moulded into different figurines. The amount of the sago fiber is added to one kilogram of clay mixes based on the ratio of sago fiber (SF) to ceramic clay (CC): Designed Mix S20C of ratio 2:10 and Designed Mix S30C of ratio 3:10. These were compared with pure clay as a control. Seven test bars of each measuring 25mm x 25mm x 150mm material with the different fiber ratios and a base clay body with no fiber added were prepared by pressing into a one-sided plaster mould. The sago fiber clay is to be pressed by hand and the open surface was smoothened with a splint. The bar were labeled as CT4 for control, UBT1 (20% SF clay), UBT2 (20% SF clay), UBT3 (30% SF clay) for unbleached and BT1 (20% SF clay), BT2 (20% SF clay) and BT3 (30% SF clay) for the bleeched bars. Testing were done at Ceramics Technology Laboratory, SIRIM Berhad Sarawak. The bars were fired in 3 range of temperature stated; 1000^{o}C, 1100^{o}C and 1200^{o}C using LT Furnace. The samples were also tested for Cracking Resistant using formulated glaze, fired at 1100°C.

Figure 1, Figure 2 and Figure 3 shows the bars fired at different range of temperature for 1000^{o}C, 1100^{o}C and 1200^{o}C. The result shows that all the sample bars were able to withstand the high temperature above 1000^{0}C to 1200^{0}C.

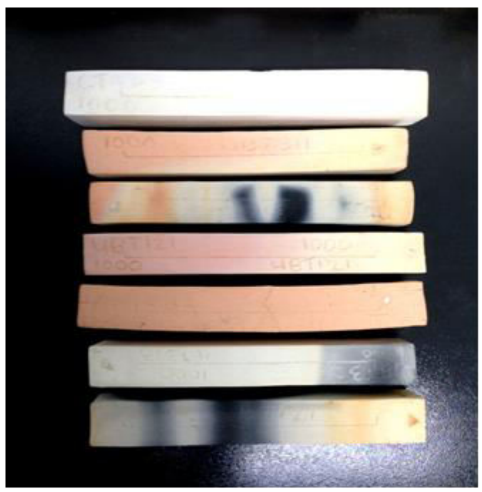

Figure 1. Bars fired at 1000° C

Figure 2. Bars fired at 1100°C

J. Solid St. Sci. & Technol. Letters, 2015, Vol. 16 No. 1-2 , pp. 36-39
http://letters.masshp.net/ | ISSN 0128-8393

Figure 3. Bars fired at 1200°C

In the Cracking Resistant test, the bars were glazed with transparent glaze and fired at 1100°C. From the Table 1, the results shows that all the samples were resistance to cracking except CT4 which is the control bar.

Table 1. Sample Cracking Resistant test result

Samples	Place 24 hours inside the Fridge	Place in Water (1 minute)	Crack	No Crack
CT4 (control)	√	√	√	
UBT1	√	√		√
UBT2	√	√		√
BT1	√	√		√
BT2	√	√		√
BT3	√	√		√

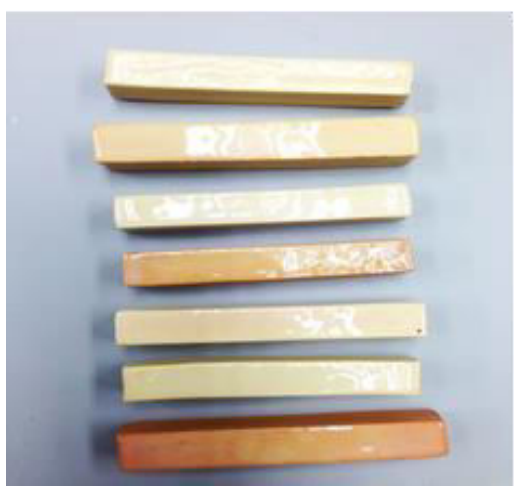

Figure 4. Samples been glazed

In this study the all the seven bars fired at a very high temperature of 1000^0C, 1100^0c and 1200^0C were stable. All of the bars CT4 or the control bar (CC) and the sago fiber (SF) clay bars were in good condition. This shows that the sago fiber clay (SF) inclusive of the UBT1, UBT2, UBT3 for unbleached and BT1, BT2 and BT3 for the bleeched bars were very strong in nature that could withstand the high temperature. In the Cracking Resistant test, the control sample bar which is the CT4 cracked when glazed and fired at 1100^0C. However no cracks was found on the sago fiber clay (SF) bars inclusive of the UBT1, UBT2, UBT3 for unbleached and BT1, BT2 and BT3 for the bleeched bars. This indicates that sago fiber bound strongly to the clay particles and increased the strength of the bars.

The findings of this study is very encouraging. Sago fiber has a potential of being a new medium for ceramic work due to the properties that bind to the clay particle and enhance the strength of the clay. The development of this research product will not only provide innovative materials for artists, but also enhanced the use of materials otherwise considered as waste. Therefore, sago fiber provides two aspects of commercial values: sales of raw materials by the rural community in the sago industry and sales of the art materials. It will also benefit other groups of people, especially artists and all art lovers who want to apply various media in new surface for their artwork.

REFERENCES

[1] A. Kelly, (1994). Concise Encyclopedia of composite materials, Elsevier science Ltd., Amsterdam.

[2] D. K., Soong and Y. C. Ling, (1995). *Chemosphere.* 30 (9), 1799-1803.

[3] D. Gay, (2002). Composite materials, Materiaux Composites, 4th ed., CRC Press LLC, Florida.

[4] G. Hay, (1996). *Ceramics Technical.* 3, 22.

[5] Information on http://www.wikipedia.org, 2008.

[6] Information on http://www.econ.upm.edu.my/-peta/sago, 2007.

[7] J.A. Kim, (2006). Paper-composite Porcelain: Characterisation of material properties and workability from a ceramic art and design perspective, Thesis for the degree of Doctor of Philosophy in Design at School of Design and Crafts, Faculty of Fine and Applied Arts, Göteborg University; Johan Öberg, Sweden.

[8] Khairul Aidil Azlin Abd Rahman, (2005). Sago Research: Utilization of Sago Bark Waste for Value-Added Product, Faculty of Applied & Creative Arts: UNIMAS.

[9] L. Juvonen, (1995). Using paper fibre as a substitute in ceramic clays, in Proceeding of the 8thCIMTEC World Ceramics Congress 1994, Vincenzini, P. (ed.), Faenza, pp 193-200.

[10] R. Gault, (1993). Paper clay for ceramic sculptors: A studio companion, Clear light pub., WA.

[11] R. Gault, (1993). Second generation ceramic sculpture: technical and aesthetic potential of paperclay, Valkonen, A. (ed.), in Interaction in ceramics, UIAH, Helsinki, pp 72-79.

[12] R. Kähkönen, (1993). Ceramics by viscose silica clothing, in Interaction in ceramics, Valkonen, A.(ed.), UIAH, Helsinki.pp 67-71.

[13] W.M.D. Wan Samiati Andriana, K.Y. Chan, A. Norazlin and M.A. Safrina, (2010). *IEEE International Conference on Advanced Management Science, Chengdu, China.*

[14] Y.L. Tie and E.T Lim, (1991). *Proceedings of the fourth International Sago Symposium, Kuching, Sarawak.* 6-9, pp 11-16.