THE PHYSICAL APPLICATION OF CERAMICS GLAZE FROM AGRICULTURE WASTE; ORANGE PEEL ASH

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ABSTRACT

The purpose of this research was to study the physical application of orange peel ash ceramics glaze from agriculture waste that affect to pottery design by 11 point Biaxial Blend and 66 point Triaxial blend technique. The raw material were used in this study are Feldspar, Kaolin and fly ash from orange peel. The composition were calculate, mixing and blending by ball mill. The clay body of test picecs were firing at 800°C before glaze coating and firing again at the temperature at 1200°C.

The results show that some of the glaze from orange peel ash show the best appearance such as good transparency, glossy, fine cracking, completely melting and a slightly down to fill on a pattern and emphasis. It can be conclude that the glaze from orange peel is suitable for pottery design. It is also beneficial to the ceramics art in terms of cost savings and preserving the environment.

Keywords— ceramics glaze, agriculture waste, orange peel, ash

INTRODUCTION

Ceramic industry was one of the top 35 export in Thailand, making more than 20,000 million Baht. The Thai ceramic industry (TCI) created big and small jobs (63,000jobs in 2544), as well as small businesses. Compared to other countries, Thailand was ranked 8th at creating tableware. (Mingsan Khosat, et al, 2002)

Moreover, Ceramics products have a long history, distinctive identity, the wisdom of cultures and identities in Thailand. Celadon and Sawankaloke pottery are the famous Thai traditional ceramics that has an interesting physical appearance such as bright and shiny green/browm color, and has a beautiful reticular cracks. (Worapong Thiamsorn, 2011)

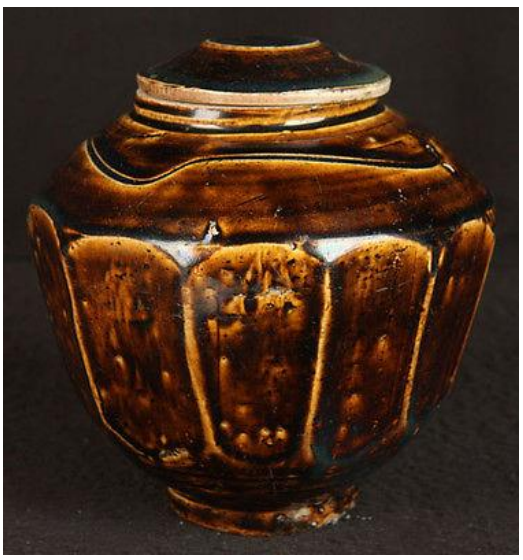
a   b

Fig. 1. (a) A Song celadon shallow dish; (www.artsmia.org, 2005) (b) A Sukhothai Sawankalok shallow dish Thailand, from the 14-16th century. Products of Sawankaloke pottery, Si Satchanalai. (http://www.finearts.go.th/, 2015)

Cracking in the glaze because the glaze is unable to sustain the tension that thereby come upon it, so it cracks.(Frank, H. and Janet Hamer, 2004) The traditional Sawankaloke is made of 50 % wood ash and local ball clay and it done through reduction firing (Seramsak nakbua, 1993). Moreover, Deforestation is

Fig. 2. Ceramics decoration at the buddhist temple of the Thepthidaram Temple.

illegal and contributes to air pollution. The chemicals of wood ash are SiO_2, CaO, K_2O, MgO, Fe_2O_3 (Seramsak nakbua, 1993). Different types of wood has different chemical composition that affects the physical appearance of the glaze. So, the chemical or minerals from the mining industry as a source of renewable raw material. But mining also causes big pollution.

Jiravut (2011). The study of pattern indentity and ceramic technique for Thepthidaram Temple Bangkok Thailand. The figure 2. Shown that the decoration tiles on the buddhist temple were made from ceramics with glaze from ash. All of it were imported from China. Moreover The figure 2 show more than 3 color were found on it.

Nowadays, many companies in the industrial sector have been awakening to industrial waste management. The principle of 3R implementation of industrial waste include (1) to reduce wastes and by-products from manufacturing process; (2) to reuse wastes and consume the products; (3) to recycle and recover wastes, consume the products and unreusable materials (Worapong Thiemsorn, 2011; Tanavadee. Leejakphai, 2003; Frank, H. and Janet Hamer, 2004).

Sermsak: 1993said, All type of ash from plant can be used as a raw material to make the beautiful glaze but it give the effect of physical appearance were difference. So the suitable type of ash were important to make the glaze

OBJECTIVE

The physical application of ceramics glaze from agriculture waste that effect to decorating technique of ceramics design in Thailand.

METHODOLOGY

In this research researcher were focused on the physical application of ceramics glaze from agriculture waste that effect to decorating technique of ceramics design.

1. Collect the raw material (Orange peel) from agriculturist make ash.
2. Then Dry it on the sun as clean as possible.

Fig. 3. Orange peel from agriculturist.

3. All Orange peel were calcined at 1200 °C.
4. Biaxial technique, Mix Kaolin and Orange peel ash before blending by pot mill for 30 minute. Coating by glaze with a thickness between 1- 1.5 millimeter on a test pieces that made of stoneware.

Fig. 4. Raw material after firing in the temperature 1200˚C

5. Triaxial technique, Mix Kaolin, Orange peel ash and Feldspar before blending by pot mill for 30 minute. Coating by glaze with a thickness between 1- 1.5 millimeter on a test pieces that made of stoneware.
6. Firing at 1,200 °C with electronic kiln.
7. After the product was completed, physical analysis was conducted with in order to investigate the following properties:
    - fusibility
    - texture and color
    - translucency and opacity
    - isolation of glaze

RESULTS

Starting with vary two raw material between ball clay and orange peel ash by the biaxial Blend to find the melting point. The first sample start with 100% Kaolin and 0% of orange peel ash. Next, to Increase the amount of ash (by weight) and reduce the amount of ball clay by 10 %. In every each sample has a total of 100%. Coating by glaze with a thickness between 1- 1.5 millimeter on a test pieces that made of stoneware. Then firing at 1,200 °C with electronic kiln. The physical application of glaze as shown in table 1. When increase the volume of orange peel ash the color of sample were turns brown and darker as the

amount of ash increases. Moreover, sample no.8-11 shown that the glaze starting a little bit melting but not complete. There are likely to developments in the next.

Table 1. The composition of sample by biaxial blend with the physical appearance of sample after firing at 1,200 °C

Sample No.	1	2	3	4	5	6	7	8	9	10	11
Kaolin	100	90	80	70	60	50	40	30	20	10	0
Ash	0	10	20	30	40	50	60	70	80	90	100
physical appearance											

The next step to develop the glaze by add flux in the system of glaze composition. Researcher used the triaxial blend technique. Potassium Feldspar were used as a flux with the other two raw material that were used at the previous test (ball clay and orange peel ash). Proportion of raw materials in each sample as shown in Fig. 5. (A = Kaolin form Ranong province, Thailand, B = Orange peel ash, C = Potassium Feldspar)

The result shown that, the composition of glaze consist of orange peel ash, feldspar and Ball clay, glaze no 4,7,8,11,12,13,18 – 26 (green area) can be used as a matte glaze and glaze no. 29 - 34, 43 - 37 (red area) show the potential of beautiful semi-matte glaze.

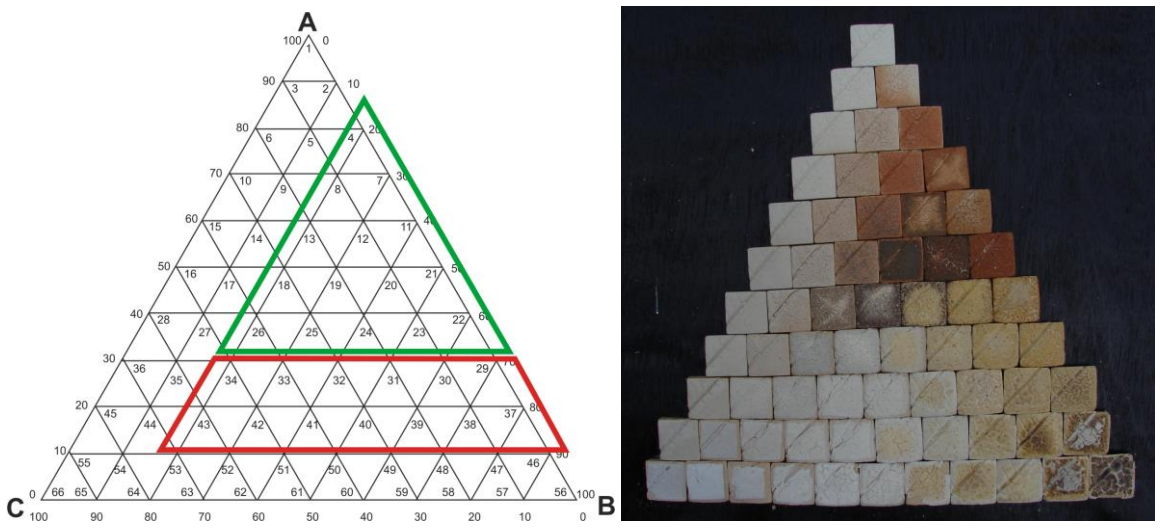


Fig. 5. 66 point triaxial blend table with test piece after firing at 1200˚C

CONCLUSION AND FUTURE WORKS

The results shown that the glaze from orange peel ash show the good appearance such as fine brown color, cracking, glossy. It show that the glaze from orange peel ash can be used as the opportunity for ceramics decorative.

For further study.

1. The researcher should be try to glazing the prototype of glaze on pottery to show the fine finishing.
2. Try to change the flux for more melting glaze appearance.

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