

## 2023 Research: Alternatives to Khamouk II

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In previous studies, research teams from Minobusan University have studied the combination of lacquer and the ash of the bodhi tree that is commonly called khamouk to discover the ratios used<sup>1</sup> and to study alternatives to bodhi tree ash that are used in Thailand and other areas of Southeast Asia.<sup>2</sup> However, there is one country with a blooming lacquerware culture that we had not researched: Myanmar. Political instability has led to the closing of many lacquerware workshops. Artisans who spent their entire lives learning the craft are now having to leave the industry in their fight for survival. But fortunately, many of these artisans participated in research or made Youtube videos explaining their complicated lacquerware production process before the government was overthrown by the military regime and the country entered its current period of chaos. Through these, we can learn that bone ash, usually made using water buffalo bones, rice straw ash and peanut shell ash have also been mixed with lacquer and used in a similar way to khamouk. In this research we will experiment with these materials and compare them to other materials used to make variations of khamouk.

### Background

Bone ash has popped up again and again in previous research as a material that is combined with lacquer. As explained in an article for the National Museum of Asian Art, “Many of the techniques used in the production of the three buddhas under discussion here, such as mixing lacquer with bone ash,

were known in China as early as the Warring States period (475-221 BCE), which saw the flourishing of lacquer to make coffins, boxes, and other vessels. The use of cloth between lacquer and wood, as well as the addition of bone, blood, and other substances, also occurred at that time, as did the hollow-core lacquer technique.”<sup>3</sup> The hollow-core lacquer technique is also known as the kanshitsu technique. The tradition has continued for at least 2200 years, and lacquerware artisans in Myanmar still swear by it. In The evolution of the materials used in the yun technique for the decoration of Burmese objects: lacquer, binding media and pigments, by Diego Tamburini, Verena Kotonski, Anna Lluveras-Tenorio, Maria Perla Colombini and Alexandra Green,<sup>4</sup> the following excerpt is written:

*Materials and manufacturing processes remained similar over the period from the late nineteenth to twenty first centuries, which is a testament to a continuous tradition of craftsmanship. Any decorative layers require a smooth substrate, which is achieved by applying a paste called thayo to fill any interstices the work piece might show. Thayo paste consists of lacquer mixed with fillers, varying from coarse particles (e.g. sawdust ash) for the initial layers to fine particles (e.g. cow bone or cow dung ash) for layers closer to the decorative surface. The thayo ground is then covered with a series of 5-20 lacquer coatings without filler.* In the abovementioned study, the following materials are listed as materials that are combined with lacquer to make a filler in the yun technique (also known as the kinma technique) in Myanmar: ash of cow bone; ash of bran/husk of paddy; ash of teak wood; ash of cow-dung; rice straw ash; red earth (“for 2nd class ware”) and ash of groundnut hulls. In the UN (United Nations Industrial Development Organization) 2014 study entitled Diagnostic Study on a Lacquerware Cluster in Bagan and Nyaung-U, Myanmar,<sup>5</sup> a flow chart explaining the production of traditional Myanmar lacquerware clearly states that bone ash is used as the filler, and The Black Elephant Lacquerware pamphlet from the Black Elephant Studio workshop in Bagan shows step-by-

step photos of the lacquerware process, including the use of bone ash.<sup>6</sup> In Youtube videos made by lacquerware producers in Myanmar, the use of bone ash can be seen in both Bagan and Myinkaba (Traditional Burmese Lacquerware Making; Myanmar 2012 - Lacquerware making in Myinkaba<sup>7</sup>), and sawdust powder (Bagan Lacquerware step by step<sup>8</sup>) and peanut shell ash (Myanmar : Lacquerware Workshop (with explanation of the techniques applied) in Bagan<sup>9</sup>) are also mentioned as materials that are used. In previous research we compared cow dung and the ash of cow dung with banana leaf ash and coconut shell ash, two materials used in Thailand. As published in this research, “The banana leaf ash and the coconut ash had the same apparent specific gravity, 0.476...the shapes molded using the banana leaf ash and lacquer mixture (Figure 22) and the coconut ash and lacquer mixture (Figure 23) have clear and smooth surfaces and edges. Put simply, ash particles are small and can be kneaded into lacquer and molded easily.”<sup>10</sup> Rice straw and peanut shells are also plant materials with a high fiber content that would ordinarily become waste so they are convenient, cheap and easy to use. The obvious assumption is that people used whatever high fiber plant material was convenient to make ash, then combined the high fiber ash with lacquer for use in products.

### About fillers to combine with lacquer

There are three important aspects that determine whether a filler is appropriate or not. These are as follows.

1. The size and shape of the particles
2. Flocculation - whether the particles are distributed evenly or not. For non-experts, this is like when cooking with flour; you don't want lumps in your flour, you want it to be evenly mixed in.
3. Whether there are voids or gaps between the lacquer and the filler.

Chemical content can also affect results. For example, the bodhi tree ash that

is usually used when restoring Buddhist statues has a high ratio of calcium, but the banana leaf ash that we used for experimentation in our Alternatives to Khamouk research has a higher ratio of potassium.

## Materials and Preparation

### Bone Ash

We used the bones of a 5-6-year old male black buffalo raised in Ban Kochmanh, a farming area about 30 minutes from the center of Luang Prabang in Lao PDR that was the source of most of our locally acquired materials. The buffalo had been killed that day, but there was very little meat remaining on the bones. We then boiled the bones for 3 hours and dried them in the sunshine for 3 days. After that, we put the bones directly on a fire until the color became white. After that, we left the bones in the sunshine for a few more days and then ground them using a traditional mortar. After that, we sifted with two sieves, one above the other, and collected the particles that remained on the lower sieve to ensure an equal size of particle.



### Peanut Shells

Peanut shells are commonly sold in Luang Prabang as fertilizer. Lao people who were interviewed said that before COVID-19 many farmers had used more expensive fertilizers, but returned to older traditional methods such as the use

of peanut shells when money got tight during the pandemic. When we went to Ban Kochmanh to buy the shells we were told that we had good timing because the peanut shells sold out quickly, but we had arrived in time to buy them. We put the shells into a large pot and set fire to them, then pounded them and sifted them five times. After that, we sifted with two sieves, as explained above.



### Rice Straw

The rice straw was also bought at Ban Kochman. The farmer who sold it to us had a huge pile of rice straw under a roof (no walls, just a roof). When planting, it is a common custom to line rice straw in rows, burn the straw, water well and grow seedlings in the ashes. The rice was glutinous rice, called khao nyao in Laotian. As with the peanut shells, we put them in a pot and set fire to them, then pounded them and sifted them with two sieves as explained above.



### Apparent Specific Gravity Chart

After preparing the materials, we calculated the apparent specific gravity. The results can be seen in the chart below.

apparent specific gravity

rice straw	0.30 g/ml
peanut shell	0.47 g/ml
bodhi tree	0.67 g/ml
bone ash	1.19 g/ml

### Lipophilic Testing

Dr. Hiroshi Oyabu, Adviser to the Kyoto Municipal Institute of Industrial Technology and Culture and Lecturer at Kyoto City University of Arts, conducted lipophilic testing to determine whether the materials we were using are compatible with oil or not. The technique itself is rather simple: one puts a small amount of a substance on a board and then mixes in oil until it is saturated and no more oil can be mixed in.



The results of the test can be seen in the chart below. Put simply, rice straw ash and peanut shell ash could take in a similar amount of oil, but the fine rice straw ash crystals worked better than the larger, harder peanut shell ash.

Likewise, the bodhi tree ash and the buffalo bone ash took in a similar amount of oil, but the finer bodhi tree ash was easier to work with than the larger, harder peanut shell ash. The buffalo bone ash wasn't absorbent, and couldn't take in a lot of oil.

#### Lipophilic testing

Material	amount of ash (g)	amount of oil (g)	% ash/oil (wt)
Buffalo bone ash	1.2	0.9	57/43%
Rice straw ash	0.3	0.4	43/57%
Peanut shell ash	4.0	6.0	40/60%
Bodhi tree ash	0.6	0.5	55/45%

#### Seven Khamouk Experiment

In the seven khamouk experiment, we used the following seven types of ash: bodhi tree ash, buffalo bone ash, rice straw ash, peanut shell ash, coconut shell ash, banana leaf ash and buffalo dung ash. Details of preparation of the latter three types can be seen in our previous research.<sup>11</sup>

First, our khamouk expert Vilaivanh Phomsamai, who is a curator in charge of registering and cleaning the artifacts in the Royal Palace Museum of Luang Prabang, heated the lacquer slowly in a frying pan over an electric stove at 200 degrees C. We used Myanmar lacquer that had been imported from Thailand. It had been thinned slightly using solvent. She usually heats lacquer for khamouk for 12 minutes, but this time Dr. Oyabu asked her to heat a little longer because firmer lacquer requires less ash and dries faster. The test for determining whether the lacquer has reached the correct state was as follows: Drop one drop of the heated lacquer in water. It should sink, become the smallest possible volume, a ball shape, and then rise. The viscosity was then checked manually, by squeezing the drop of lacquer between two fingers, to determine that it had attained an appropriate viscosity for the creation of khamouk.





After the lacquer reached the correct state, Vilaivanh Phomsamai slowly added ash to make khamouk as explained in our previous research.<sup>1</sup> Then Sithong Siveunxay, teacher of eoodcarving at the Institute of Fine Arts, Vientiane brushed a khamouk mold with bodhi tree ash to prevent sticking, pressed the khamouk into the mold and rolled it, then carefully removed the molded khamouk. After all seven types had been molded, Vilaivanh Phomsamai and Sithong Siveunxay discussed which had been easier to use and mold, and ranked the seven types as follows. This ranking is based on handling alone; a follow-up ranking will check for breakage and other problems at a later date.

1. Bodhi tree ash – this is our standard go-to ash because it’s the only type that can be used for Buddhist statues.
2. Rice straw ash – this was soft, easy to mix, easy to use, and the khamouk made from rice straw shone in a way that only khamouk made from fine particles can.
3. Banana leaf ash – this was easy to use and didn’t stick to the mold.
4. Peanut shell ash – the feel was very similar to bodhi tree ash, and this type came out of the mold more smoothly than any other type.
5. Water buffalo dung ash – this was similar to khamouk made from rice straw but not as good because the particles were bigger and harder than the straw ash.
6. Coconut shell ash – this didn’t blend in as well as other types and couldn’t be



stretched like other types. Its only good point was that it didn't stick to the mold.

- Water buffalo bone ash – as shown in the lipophilic testing, this ash does not absorb oil, so it was difficult to handle and retained the stretchy stickiness of hardened lacquer. The larger particles and lack of absorbency indicate a higher chance of breakage than the other types.



March 5, 2023 Khamouk chart	apparent specific gravity	amount of lacquer in khamouk	amount of ash in khamouk	PWC lacquer/ ash	PVC lacquer/ ash	ranking (subjective)
Bodhi tree ash	0.67	3.0 g	5.7 g	35/65%	28/72%	1
rice straw ash	0.3	8.0 g	5.0 g	62/38%	34/66%	2
peanut shell ash	0.47	5.0 g	5.0 g	50/50%	33/67%	4
bone ash	1.19	2.0 g	12.5 g	11/69%	13/87%	7
coconut shell ash	0.48	3.0 g	4.0 g	43/57%	27/73%	6
banana leaf ash	0.48	4.0 g	5.0 g	44/56%	28/72%	3
buffalo dung ash	0.32	4.0 g	6.0 g	40/60%	18/82%	5

## Conclusions

Bodhi tree ash can be hard to get. It is the only type allowed for use in restoring sacred Buddhist statues, and it ranked first in handling in our seven khamouk comparison. However, when restoring or creating other objects that are not sacred, for example, a base for a statue or an object that is not related to religion, it is clearly possible to use cheaper, readily available alternatives such as rice straw or banana leaf ash instead.

This study was conducted as part of an annual project by Minobusan University and the Ministry of Information, Culture and Tourism of Laos (MICT). Follow-up research in future years is necessary to check the durability of each material over time.

## Acknowledgement

I would like to express my gratitude to Kyoto Municipal Institute of Industrial Technology and Culture Advisor Dr. Hiroshi Oyabu for his invaluable advice and support in this research, to Ms. Vilaivanh Phomsamai for sharing her expertise in Lao lacquer and khamouk, to Mr Sithong Siveunxay for his full cooperation in molding and discussing all combinations of lacquer and materials discussed in this research, and to Chihiro Moriwaki for her dedicated assistance.

### Footnotes

- 1 2018 Khamouk Study, Jill Emma Strothman, Minoru Suzuki, Viraivan Phonsamai; 『日蓮学』2, 2018/10
- 2 Alternatives to Khamouk in Southeast Asia (2020), Jill Emma Strothman; 『日蓮学』4, 2020/10
- 3 Lacquer and Buddhist Sculpture in East Asia, Sixth–Eighth Century, Denise Patry Leidy, Smithsonian, National Museum of Asian Art article  
<https://asia.si.edu/essays/lacquer-and-buddhist-sculpture-in-east-asia-sixth-eighth-century/>
- 4 The evolution of the materials used in the yun technique for the decoration of 4 Burmese objects: lacquer, binding media and pigments, Heritage Science Volume 7, Article number: 28 (2019) by Diego Tamburini, Verena Kotonski, Anna Lluveras-Tenorio, Maria Perla

Colombini and Alexandra Green

- 5 Diagnostic Study on a Lacquerware Cluster in Bagan and Nyaung-U, Myanmar, Copyright© 2014 by the United Nations Industrial Development Organization (UNIDO) Myanmar Business Development Consulting and Michele Boario, Tint Khine and Stephanie Promberger from UNIDO.
- 6 BLACK ELEPHANT LACQUERWARE pamphlet (available online at/sites/hladaymyanmar.org/files/uploads/file/lacquerware\_booklet\_26dec.pdf), Feb 11, 2020
- 7 Traditional Burmese Lacquerware Making, Cristofre Martin Youtube channel; Myanmar 2012 - Lacquerware making in Myinkaba, 4ever2wherever Youtube channel
- 8 Bagan Lacquerware step by step, Jorge Leonard Obeso Youtube channel
- 9 Myanmar : Lacquerware Workshop (with explanation of the techniques applied) in Bagan, Erik van Dyck Youtube channel
- 10 Alternatives to Khamouk in Southeast Asia (2020), Strothman; 『日蓮学』 4, 2020/10
- 11 Alternatives to Khamouk in Southeast Asia (2020), Strothman; 『日蓮学』 4, 2020/10