

A Survey of Lacquer samples from Myanmar and Cambodia

Hanna Szczepanowska¹, and Rebecca Ploeger²

¹ West Virginia University, College of Creative Arts, School of Art and Design, Morgantown, WV, USA
² SUNY Buffalo State, Patricia H. and Richard E. Garman Art Conservation Department, Buffalo, NY, USA



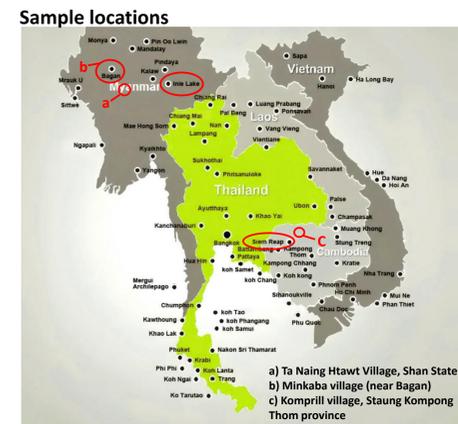
Download the poster
 or
<https://artconservation.buffalostate.edu/>



Poster session II
 May 9, 2019

P2-21

Myanmar and Cambodia



Introduction and aim

Lacquer, the natural latex produced by some indigenous trees of the Anacardiaceae family in Asia, has been used for centuries as a utilitarian material, as well as for decorative vessels, lacquer paintings, and surface finishes on religious statues.

The aim of this work is to contribute to the current knowledge of lacquer in its regional context in the relatively less explored, Myanmar (*Gluta usitata*) and Cambodia (*Gluta laccifera*). These thitsiol-based lacquers were studied to help distinguish the raw materials with respect to their provenance, and to determine if lacquer samples could be traced back to their original geographical source, tree species, or associated workshop.

Harvesting the lacquer

The difference in harvesting methods

Myanmar, Shan State

- heart-shape incision - an example of a newly made cut.
- an old incision showing black lacquer that has polymerized on the tree and in a bamboo vessel



July 2018
 Photos by H. Szczepanowska

Cambodia

- V-shape incisions
- metal semi-round tool used for the incision
- bamboo vessel inserted into tree - used for collecting the lacquer



October 2015
 Photos by H. Szczepanowska

The tree species and thitsiol

Myanmar

The production of lacquerware is an important cottage industry in Myanmar, and thitsiol is regarded as one of the region's oldest non-timber forest products. The latex is collected from the lacquertree (*G. usitata*) and has a phenolic/catechol compound profile for thitsiol lacquer.

Cambodia

The latex from *G. laccifera* is noted as used for lacquerware and paintings in Cambodia. It has a similar phenolic/catechol compound profile as a thitsiol lacquer (harvested from *G. usitata*). It was originally called 'moréacol' after the name of the lacquer (moréac) from this tree species [1].



Photos by H. Szczepanowska
 Gluta laccifera observed during fieldwork by Siem Reap, Cambodia. Left: detail of the leaves and fruit; right: detail of the flowers (inset: flowers)

Both latexes are off-white when they exit the tree, but within minutes begin to turn dark brown/red to black.

The samples

- 4 samples of unadulterated latex were collected directly from trees- Myanmar (2) and Cambodia (2).
- 10 samples of lacquer from workshops in Bagan and Minkaba, Myanmar were collected.
 - some were described as having an additive, or a variety of additives, mixed in to extend 'fluidity' or to act as a 'filler'.
- 2 reference samples of ashed rice husk were collected (Cambodia and Myanmar).

Description of the samples (* indicates samples featured in Results)

Provenance	Notes
Myanmar, Inle Lake, Nampan village	From family workshop; source claimed that lacquer is without additives (collected July 2018)
Myanmar, Kakku, Ta Naing Htawt village*	Sap from tree, collected during fieldwork in forest (Shan State) (collected July 2018)
Myanmar, Shan State	Sap from tree, collected by a Vietnamese lacquer artist in the forest (collected Sept 2017)
Myanmar, Bagan, Black Elephant workshop	From a family workshop, source claimed that lacquer had an 'additive' (collected Sept 2017)
Myanmar, Bagan, Black Elephant workshop	From a family workshop, source claimed that lacquer had an 'additive' (collected Sept 2017)
Myanmar, Bagan, Everstand workshop	Collected by a colleague, noted as a 'high quality' lacquer (collected Apr 2017)
Myanmar, Bagan, Everstand workshop	Collected by a colleague, noted as a 'low quality' lacquer with water (collected Apr 2017)
Myanmar, Minkaba village lacquer shop	Collected by a colleague, no information about additives (collected Apr 2017)
Myanmar, Bagan	Collected by a colleague, no information about additives (collected Apr 2017)
Myanmar, Inle Lake*	Collected by a colleague, sample was a solid cake (no information about additives) (collected Apr 2017)
Myanmar, Bagan, U Ba Nyein lacquerware shop in New Bagan	Collected by a colleague, no information about additives (collected Apr 2017)
Myanmar, Kyaing Tong, U Mu Ling Ta lacquer shop	Collected by a colleague, no information about additives (collected Apr 2017)
Cambodia, Nd of Siem Reap	Sap from tree, collected during fieldwork in forest near Siem Reap, unconfirmed <i>G. laccifera</i> (collected Oct 2015)
Cambodia, Siem Reap	Solidified lacquer deposit on tree, collected during fieldwork in forest near Siem Reap, confirmed <i>G. laccifera</i> (collected Oct 2015)
Cambodia, Siem Reap	Ashed rice husk additive (Siem Reap, Angkor Art Studio, sample from E. Stocker) (collected Sept 2018)
Myanmar, Inle Lake	Ashed rice husk additive, collected during fieldwork (collected July 2018)

Instrumentation

Py-GC-MS: Frontier Lab Py-2020iD double-shot pyrolyzer, Agilent 7820A GC and 5975 MS. Phenomenex ZB-5MSi column (l 30m, i.d. 0.25mm, film 0.25µm). Followed GC and analysis protocol from the RADICAL (Getty Conservation Institute and J. Paul Getty Museum) ESCAPE expert system.

FTIR: Continuum microscope coupled to a Nicolet 6700 FTIR spectrometer (Thermo Scientific). Spectra are the average of 64 scans at 4 cm⁻¹ resolution. Omnic 8.3.103 software.

FESEM-EDS: Field emission scanning electron microscope (FESEM) Hitachi SU5000 coupled with energy dispersive X-ray spectroscopy (EDS) Bruker XFlash 6/60. Back scattered electron mode (BSE) was used in 60Pa vacuum, with 20kV beam acceleration, at 50-60 intensity spot and working distance of 6-10mm. Bruker's processing software.

XRF: Bruker Tracer 5i, 0.5mm collimator. Scanned on a DeWitt MSS-150E scanner at 0.5mm in the X x 1mm in the Y. 30kV 110µA no filter. Scan size 40x45mm. Please see poster P2-133 for additional information.

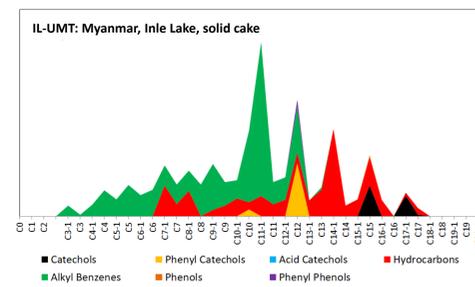
Research carried out between SUNY Buffalo State, USA, and the Heritage Conservation Centre, Singapore.

References:

- Bertrand G, Brooks G. Bulletin de la Société chimique de France 1934; 5:109-14.
- Schilling MR, Heginbotham A, van Keulen H, Szelewski M. Studies in Conservation. 2016; 61(sup3):3-27.
- Tamburini D, Pescitelli G, Colombini MP, Bonaduce I. Journal of Analytical and Applied Pyrolysis. 2017; 124:51-62.
- Fraser-Lu S. Burmese Lacquerware. Bangkok: The Tamarind Press; 1985.

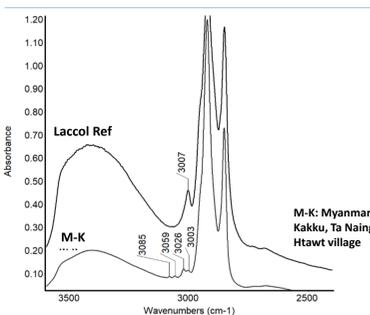
Results

All of the samples were composed of thitsiol.

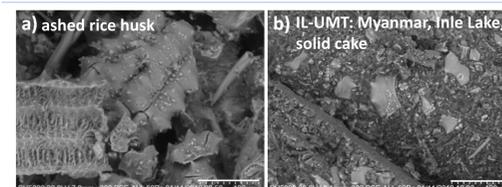


Py-GC-MS: all samples showed typical thitsiol profiles. No major organic solvent-additives were noted; some samples contained natural free fatty acids and a dipterocarpus marker (#5) [2]. Some ageing products were observed [3]. Ashed rice husk was observed in sample IL-UMT, from Inle Lake, Myanmar.

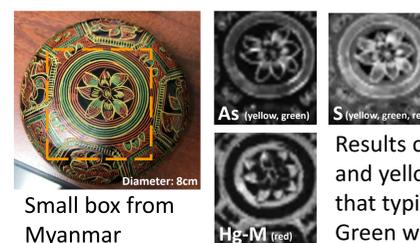
X-axis: carbon chain length (e.g. C12) and unsaturation (e.g. C12-1)
 Y-axis: amounts detected



FTIR: distinct spectral features were noted in the thitsiol samples (both from Myanmar and Cambodia) when compared to the laccol samples (from Vietnam). These were in the alkenyl and aromatic C-H stretching region between 3000 and 3100 cm⁻¹ and may represent the different substituted catechols, phenols and aromatic compounds / moieties identified in thitsiol. Thitsiol contains 1,2,3, 1,2,4, and 1,3,5 tri-substituted aromatic rings, as well as a 1,3 di-substituted aromatic ring and a monosubstituted ring.



FESEM-EDS: (a) ashed rice husk showed little change in the husk morphological structures, indicating low burning temperatures. Elemental mapping showed a high silica content. In (b) IL-UMT, the % of silica was 8.5-10.5% and fragments of ashed rice husk were evident.



XRF: Elemental mapping showed evidence of orpiment (As₂S₃) and cinnabar/vermillion (HgS).
 ~see poster P2-133 for more information (XRF scanning set-up)

Results correspond to pigments collected in the field – red, green and yellow are colours used in Bagan, Myanmar. Literature states that typical pigments are vermillion (red) and yellow (orpiment). Green was achieved by blending orpiment and indigo [4].

G. usitata (Myanmar) vs G. laccifera (Cambodia)

Cambodian sourced lacquers had profiles similar to the thitsiol profiles of the Myanmar samples (using the Getty protocols and ESCAPE system). The main difference was the lack of C₁₀ phenyl catechols in the Cambodian samples (only C₁₂ phenyl catechols were present), while all of the Myanmar samples showed both C₁₀ and C₁₂ phenyl catechols.

Acknowledgements

The NHB Heritage Conservation Centre, Singapore, where Dr. Szczepanowska was appointed as Sr. scientist during this research. Dr. Hugo Volckaert from the Center for Agricultural Biotechnology at Kasetsart University Kamphaengsaen, Thailand, for help in identifying tree species.
 Conan Cheong, assistant curator at the Asian Civilisations Museum, Singapore, for permission to analyze personal samples collected from workshops in Myanmar.
 Eric Stocker, Owner of the Angkor Artwork E&T Stocker lacquer gallery (Siem Reap, Cambodia)
 Michael Schilling (GCI), Catherine Matsen and Mike Szelewski (Winterthur Museum) for help with AMDIS and the ESCAPE expert system.
 Dr. Aaron Shugar for the XRF analyses of the lacquer box.
 Andrew W. Mellon Foundation for funding.