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► **To cite this version:**

Caroline Thomas, Frédéric Leblanc. Evaluation project for cleaning methods on Boule marquetry. Heritage Wood : Research and Conservation in the 21st century, ICOM-CC meeting, Oct 2013, Varsovie, Poland. hal-04525282

HAL Id: hal-04525282

<https://hal.science/hal-04525282v1>

Submitted on 28 Mar 2024

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Evaluation project for cleaning methods on Boule marquetry

Development of efficient and less invasive gels for brass cleaning

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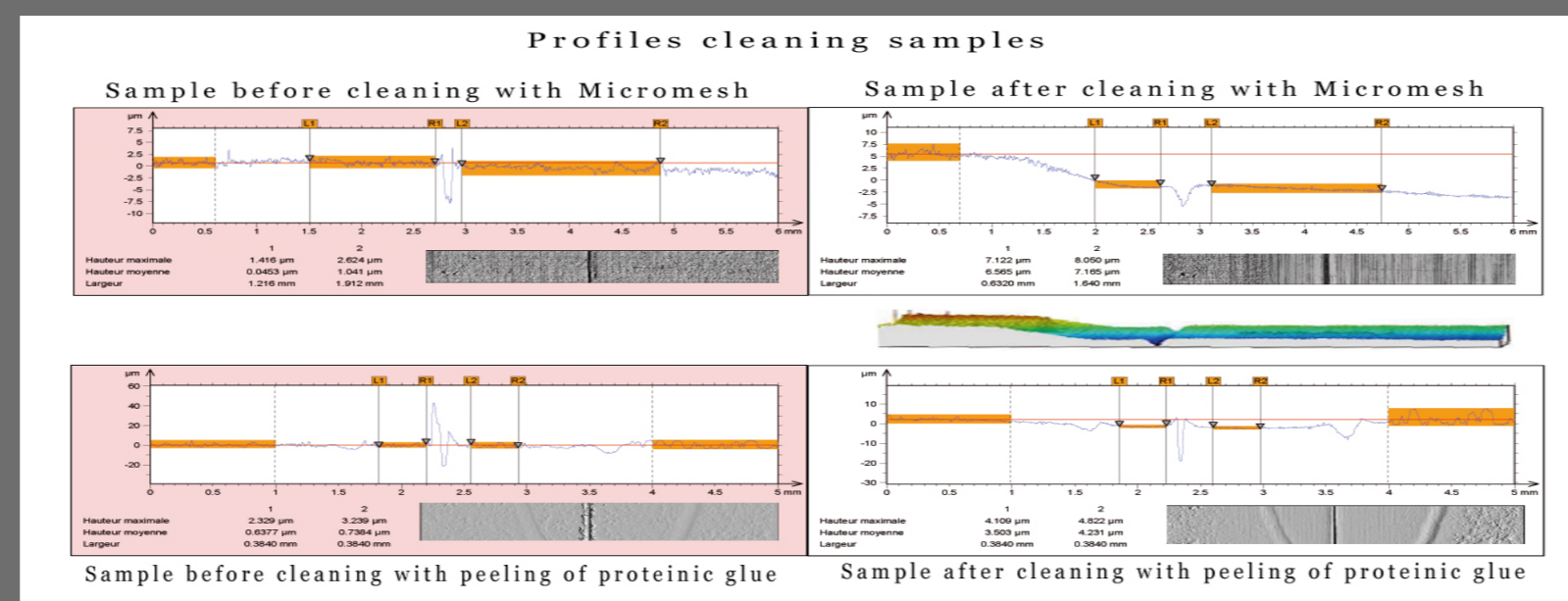
Protocol

The renovation of the 18th C. rooms in the Louvre museum has been the occasion to examine conservation treatments on Boule marquetry. This research was undertaken at the C2RMF and led by its decorative arts section.

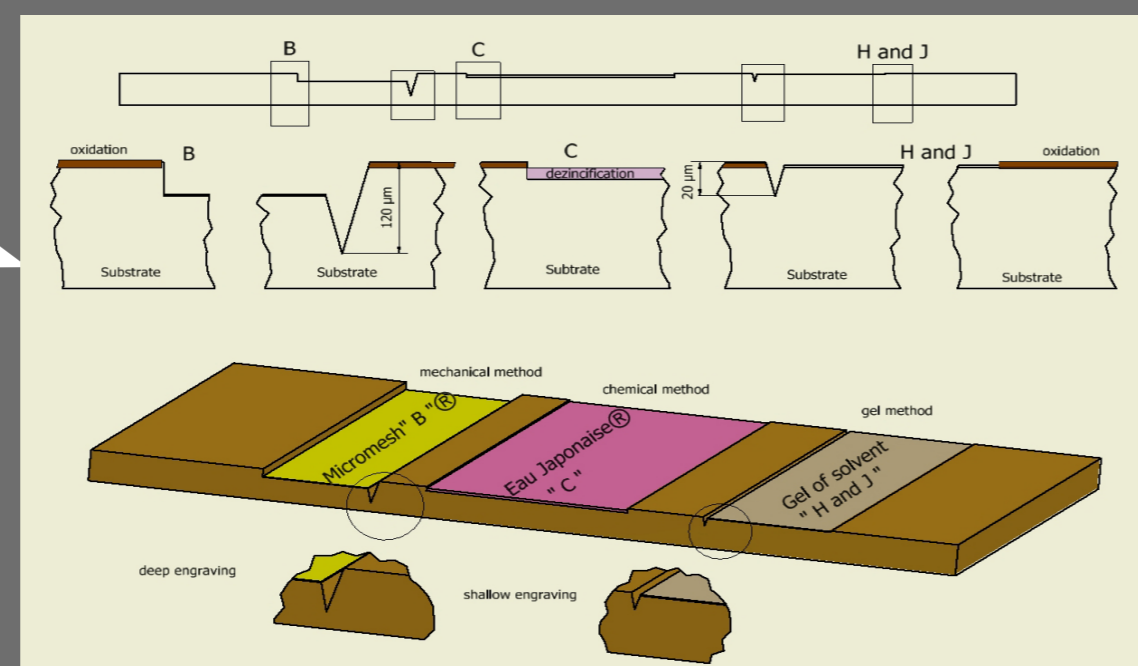
Over time, many original engravings on Boule marquetry have been erased when removing oxidised material, which led us to think about the different cleaning methods and their impacts on material, starting with brass.

Our research protocol* aimed at evaluating how much material is removed by different cleaning tools by measuring the step height between the original area and a cleaned area. The main purpose is to be able to offer less aggressive methods.

* The protocol has been presented at ICOM-CC Metal, sept. 2013, by Leblanc and Leroux, *Evaluation project for cleaning methods on historical metals: example of the profilometry technique on brass treatments.*



Impact of cleaning methods on the engraving depths



Among twenty implementations tested, some methods were more or less suited to the conservation purpose:

- Mechanical cleaning (Micromesh® "B") removes about 7 µm and gets into the material.
- Mixed cleaning, both mechanical and chemical (eau japonaise "C"), removes less material (about 2 µm) but creates a dezincification area which gives brass a pinkish shade.

Two innovative cleaning protocols (gels solvents "J" and "H") *

- We developed two close cleaning techniques, mainly chemical and slightly mechanical: they seem to be the less damageable methods, as they remove only a 1.5 µm corrosion layer and induce no micro-scratches.

Pemulen gel "H"

Room temperature

- Pemulen®
 - Citric acid
 - Triethanolamine (TEA)
- pH 7



Steps in Pemulen gel method "H"

Glue gel "J"

Warm

- Warm nerve glue
 - Citric acid
 - Triethanolamine (TEA)
- pH 7

After the gel, a white eraser Mars plastic Staedtler® is used for the surface finish. Varnish and wax are then applied in order to delay the return of corrosion.

* Paulin and Leblanc, "Memo on the restoration of Boule furniture at the Louvre: cleaning metal marquetry", *Techné* 38 (dec. 2013), p. 101-103

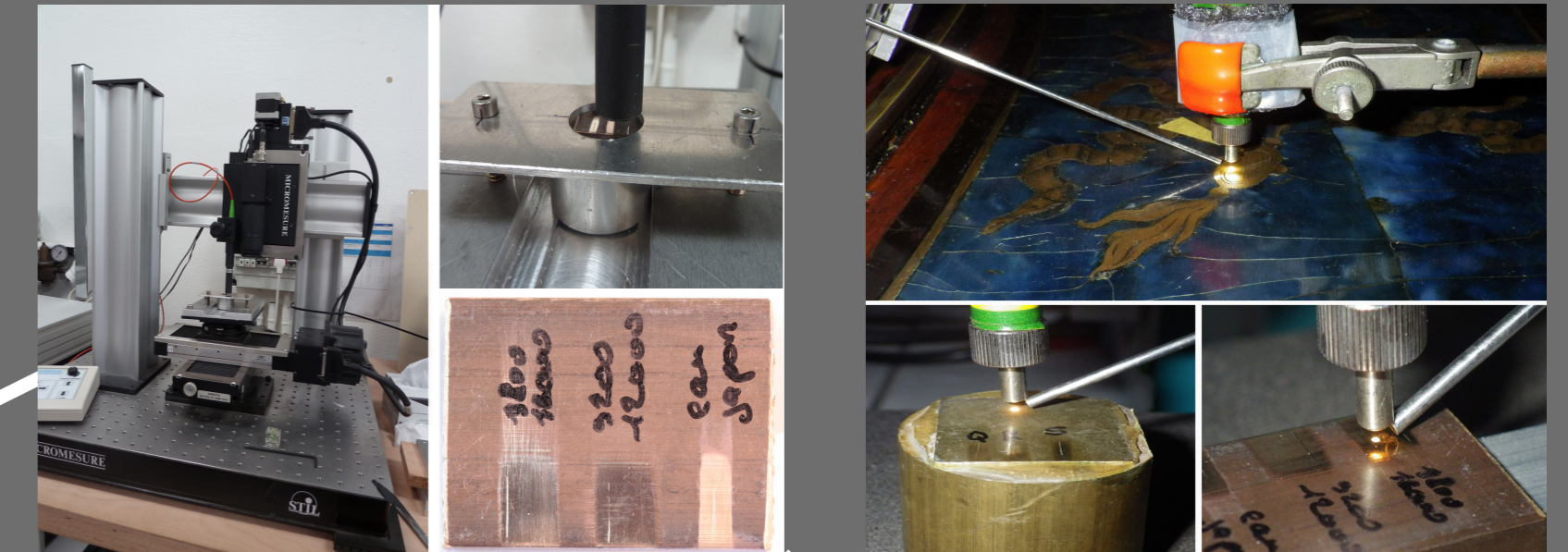
Conclusion:

This protocol led us to a classification of about twenty techniques and products regarding the abrasion levels on the brass parts of a marquetry with a correspondance in relative colorimetry. This study resulted in two innovative and efficient cleaning gels, which abrasion level on the pieces is very low.

The next step will be about measuring the resumption of corrosion in order to compare it after invasive and less destructive cleaning methods. There will also be a colorimetry measurement of the ageing samples, covered with various surface protections.



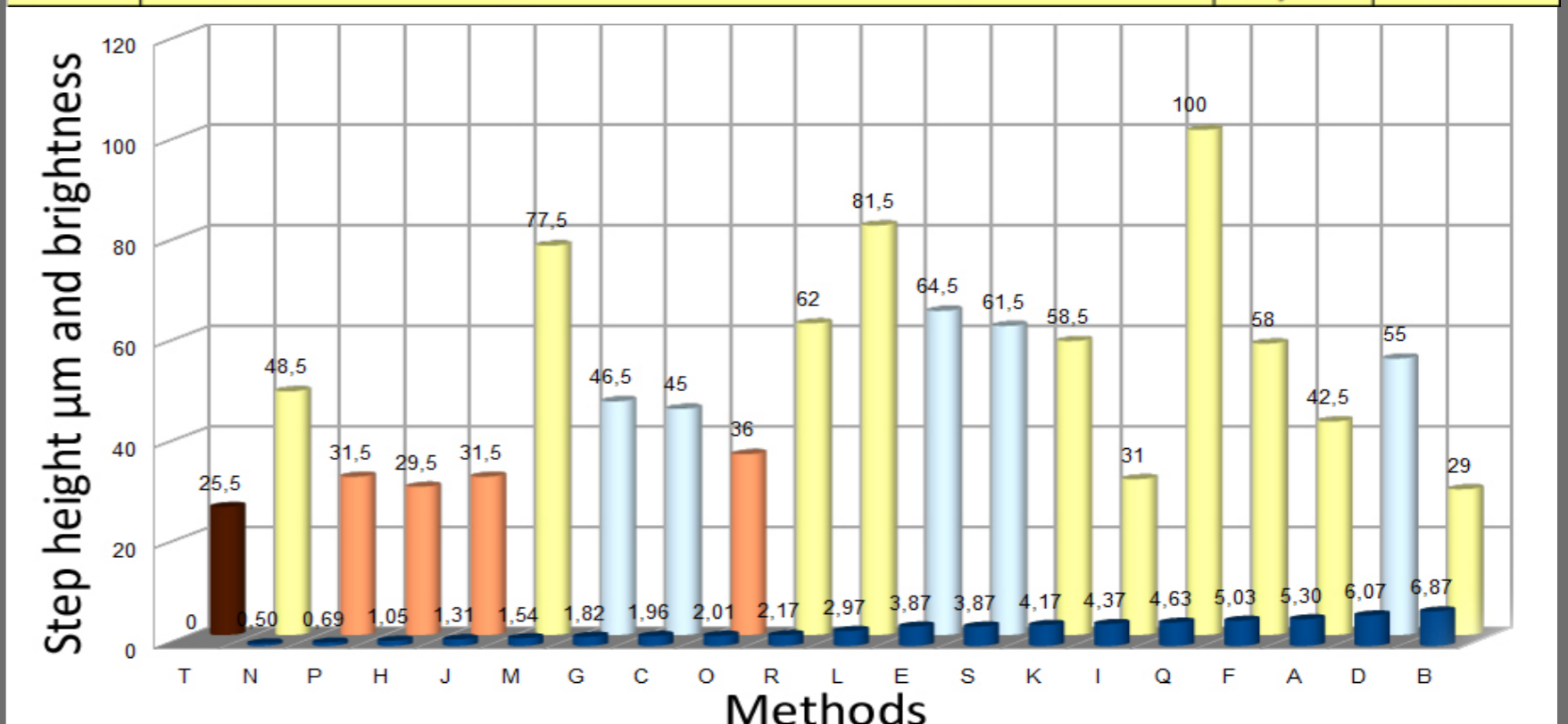
Tested products for brass cleaning.



Profilometer with the locking system on the plate (STIL confocal chromatic)

Principal scheme of colorimeter with extended depth of field (USB 4000 with a HPX-2000 Xenon Light Sources, Ocean Optics®)

N°	Methods and products	Average step height	Average Luminance 60°
T	Corrosion	0	25,5
N	Synthetic grey wool (delicate), Blue line®	0,50	48,5
P	Sodium thiosulfate pentahydrate (0,25M) + 3% Carbopol® + NaOH (pH 7)	0,69	31,5
H	Pemulen® + TAC (tri-amonium-citrate) (0,5M)	1,05	29,5
J	Nerve glue + TAC (tri-amonium-citrate) (0,5M)	1,31	31,5
M	Synthetic purple wool (average), Blue line®	1,54	77,5
G	TAC (tri-amonium-citrate) + Meudon white + glycerin	1,82	46,5
C	Eau japonaise	1,96	45
O	Sodium dithionite (0,5M) + 3% Carbopol® + NaOH (pH 6,5)	2,01	36
R	Soot + demineralized water	2,17	62
L	Synthetic red wool (lefty), Blue line®	2,97	81,5
E	Carbopol® + TAC (tri-amonium-citrate) + soot	3,87	64,5
S	Nerve glue → eraser → soot / demineralized water	3,87	61,5
K	Steel wool	4,17	58,5
I	Red Dialux®	4,37	31
Q	Fiberglass pen	4,63	100
F	Polishing paste (beeswax, vaseline oil, tripoli)	5,03	58
A	Sandpaper Micromesh® (1800 → 2400 → 3200 → 4000 → 6000 → 8000 → 12000)	5,30	42,5
D	Ouator®	6,07	55
B	Sandpaper Micromesh® (3200 → 4000 → 6000 → 8000 → 12000)	6,87	29



Examples of profilometer and colorimeter results on corroded samples cleaned and averages of the step heights ranked in increasing order compared to the luminance results (see the caption box at the bottom).



Glue peeling and result "J"