

Table 1. The sources for the recreated alloys and their composition													
Nr	Source	Cu	Au	Ag	Fe	Pb	As	Sn	Zn	Ni	Bi	Co	Reference
1	Balâța-Sichem**	91,8	0,5	0,2	0,5	0,5	3,1	3	0,1	0,1	0,15	0,05	Giumlia-Mair 1996b, 340.
2	Alloy nr.27	95	1	1	0,5	-	0,5	2	-	-	-	-	Giumlia-Mair & Lehr 2003, 297.
3	Siamun Sphinx**	94	1,3	1	0,7	1	1	1	-	-	-	-	Mathis <i>et al.</i> 2009, 68.
4	Alloy 1	95	0,6	0,3	0,5	0,5	-	3	0,1	-	-	-	See 1: no As & trace elements
5	Alloy 2	95,5	1	1	0,5	-	-	2	-	-	-	-	See 2: no As
6	Alloy 3	95	1,3	1	0,7	1	-	1	-	-	-	-	See 3: no As
7	Mycenaean dagger **	92,5	2	0,5	-	-	-	5	-	-	-	-	Ogden 1993, 42. Giumlia-Mair 2013, 100.
8	Enkomi cup	91,3	6	2	0,4	-	0,3	-	-	-	-	-	Giumlia-Mair 2013, 100.









\*Percentages as wt%; in reproduction of alloy 1, 0, 15% Sb was omitted; - : not present/detected.  
\*\*reproduction with approximated wt% to reach 100%, approaches original analyses.

Table 2. Recipes of separate patination ingredients		Literature
Natron* mix 30 g (to store and use); 35% Na <sub>2</sub> CO <sub>3</sub> , 40% NaSO <sub>4</sub> , 25% NaCl	10,5 g Natron:Na <sub>2</sub> CO <sub>3</sub> (sodium carbonate), 7,5 g NaCl (sodium chloride), 12 g NaSO <sub>4</sub> (sodium sulphate)	Lucas 1962, 267.
Experimental Rokusho (for Niiro) (modified)	2,8 g pure <i>verdigris</i> and 1 g CaCo <sub>3</sub> , (to mix with 5 ml <i>plum vinegar (incl. NaCl)</i> , 5 g <i>copper sulphate</i> and 1 liter water for the Niiro- process)	Ó Dubhghaill& Jones 2009, 293.
Lye	200 ml demineralized water, 1 g K <sub>2</sub> CO <sub>3</sub> (Potassium carbonate)	

















\*I don't know the effect if you use NaHCO<sub>3</sub> (sodium bicarbonate), just a little amount of this was used.

**Table 3. Modern Japanese patination solutions (pH: 4 - 5 at ca.37,7 - 95°C)**

Experiment	Alloy	1a1	1a2	2a1	3a1
1: <i>Rokusho</i> 1 (75 min) (ca. 37,7-50°C)	<b>Front:</b>				
	<b>Back:</b>				
		1a1	1a2		
2: Nikomi- Chakusoku (30 min)  (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				
		4a2	5a1*	6a1*	7a1*
4: <i>Rokusho</i> + 30 ml plum vinegar (60 min) (ca. 37,7-50°C)	<b>Front:</b>				
	<b>Back:*</b>				
		2a1	2a2	3a1	3a2
5: Nikomi- Chakusoku (30 min)  (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				







		4a1	4a2	5a1	5a2
6: Nikomi- Chakusoku (60 min)  (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				
		*front is unfortunately not available			

**Table 4. Modern Japanese patination solution (pH: 4 - 5 at 35 - 95°C)**

6: Nikomi- Chakusoku (60 min)  (ca. 90-95°C)	<b>Alloy</b>	6a1	6a2		
	<b>Front:</b>				
	<b>Back:</b>				
		4a1	6a2	7a1	
8: Rokusho 1 (5 days)  (35 °C)	<b>Front:</b>				
	<b>Back:</b>				
		1b2	7a1	8a2	
9: Nikomi Chakusoku (60 min)  (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				

		4a1	5a1	6a1	7a1
12: Nikomi - Chakusoku (30 min) (Exp.4 recycled) (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				
12: Nikomi Chakusoku (60 min) (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				

**Table 5: Modern Japanese patination solutions (pH ca. 4 - 5 at 25°C - 95°C)**

11a:	Alloy	4a2	11b:		6a1
Quenched red hot 1x in Rokusho 1 (500 °C in 25 °C)	<b>Front:</b>		Quenched red hot 3 x in Rokusho 1 (500 °C in 25 °C)	<b>Front:</b>	
	<b>Back:</b>			<b>Back:</b>	
		1a1	1a2	2a1	3a1
13: Rokusho 1 with salty Umeboshii plums (Exp 1 recycled) (30 min) (37,7- 50 °C)	<b>Front:</b>				
	<b>Back:</b>				





































22:		1a1	3a1	5a2	7a1
Niiro- solution (60 min)  (incl. 5 min preboiling in lye)  (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				
22: Niiro – solution (120 min)  (no preboiling in lye) (ca. 90-95°C)	<b>Front:</b>				
	<b>Back:</b>				

Table 6. Acidic patination liquids				
3:	<b>Alloy</b>	4a1		
Urine (35°C for 3 days)	<b>Front:</b>			
	<b>Back:</b>			
pH: 5,35 at 32°C				
		4a1	3a2	7a1
7: Urine + <i>verdigris</i> (35°C for 3 days)	<b>Front:</b>			
	<b>Back:</b>			
pH: 5,78 at 22 °C				
		4a1		
10a: pure plum vinegar (24 hrs)	<b>Front:</b>			
	<b>Back:</b>			
pH: 2,71 at 24 °C				
10b: plum vinegar + <i>verdigris</i> (24 hrs)	<b>Front:</b>			
	<b>Back:</b>			
pH: 4 at 25 °C				

		5a1	
14: Pomegranate + Natron mix med (72 hrs at 35 °C) pH: 5,38 at 24,7 °C	<b>Front:</b>		
	<b>Back:</b>		

**Table 7. Acidic patination liquids**

16a:	Alloy	6a2	16b:	Alloy	6a2
red wine (no sulphides ) pH: 3,67 at 25,5°C (24 hrs9	<b>Front:</b>		Red wine (no sulphides ) +Natron Mix pH: 5,71 at 22,7 °C (24 hrs)	<b>Front:</b>	
	<b>Back:</b>			<b>Back:</b>	
		5a2			
17: white grape sauce ( 72 hrs at 37°C) pH: 3,83 at 25,7 °C	<b>Front:</b>				
	<b>Back:</b>				
		2a1			3a2
18a: wrapping in cloth –	<b>Front:</b>		18b: wrapping in cloth-	<b>Front:</b>	











tapwater + <i>verdigris</i> (48 hrs) pH: 5,81 at 24,1 °C	<b>Back:</b>		tapwater + alum (48 hrs) pH: 5,93 at 25,3 °C	<b>Back:</b>	
		6a1			
19b: Water + Alum pH: 3,78 at 24,7 °C	<b>Front:</b>				
	<b>Back:</b>				
		1a2			3a1
20a: plum vinegar vapour ( 24 hrs)  pH: 2,71 at 24°C	<b>Front:</b>		20b: plum vinegar vapour (72 hrs) pH: 2,71 at 24°C	<b>Front:</b>	
	<b>Back:</b>			<b>Back:</b>	

Table 8. Neutral to alkaline patination solutions					
19a:	<b>Alloy</b>	6a1			
Tapwater (96 hrs at  (pH: 7,29 at 24,5°C)	<b>Front:</b>				
	<b>Back:</b>				







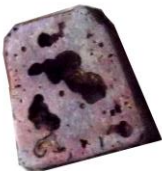


		7a2			7a2
19c: tapwater + pure natron (72 hrs) (pH: 8,15 at 24, 7 °C	<b>Front:</b>		19d: tapwater+ natron mix (with NaCl & NaSO <sub>4</sub> ) (72 hrs) pH: 8,16 at 25, 7 °C	<b>Front:</b>	
	<b>Back:</b>			<b>Back:</b>	

Table 9. Dry experiments					
11c: Heated with gas burner to 500 °C	<b>Alloy</b>	7a2			
	<b>Front:</b>				
	<b>Back:</b>				
		5a1	5a2	7a1	7a2
15: Wu –Tong (sweaty hands) (ca. 2-3 hrs)	<b>Front:</b>				
	<b>Back:</b>				
		1a1			8a2
21: Heat treatment “black satin” ( 60 min)	<b>Front:</b>		21: Heat treatment “Black Satin” (120 min)	<b>Front:</b>	
	<b>Back:</b>			<b>Back:</b>	

**Table 10. Experiments with seawater and sweaty hands (November 2017)**

	Alloy	Front:	Back:		
24: Seawater (Kiel- Schilksee, pH 8) November 2017	2a1			23: wearing on hand Mokume Gane ring with shakudo	
25: Sweaty hands November 2017	5a1:	