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SUPPLEMENTARY INFORMATION

Nano-micro crystals revealed on tang dynasty gilded bronzes using advanced TEM-SEM and synchrotron methods.

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S1: Au alloy thin layer subjected to TEM-EDS

TEM-EDS was collected with FEI T20 (200 KV) microscope at Nanomegas laboratory (Brussels) from the FIB cut which is from the interface between the corrosion and the bronze material. In the thin "gold layer" main presence of Hg and Au is confirmed (Fig. S1)

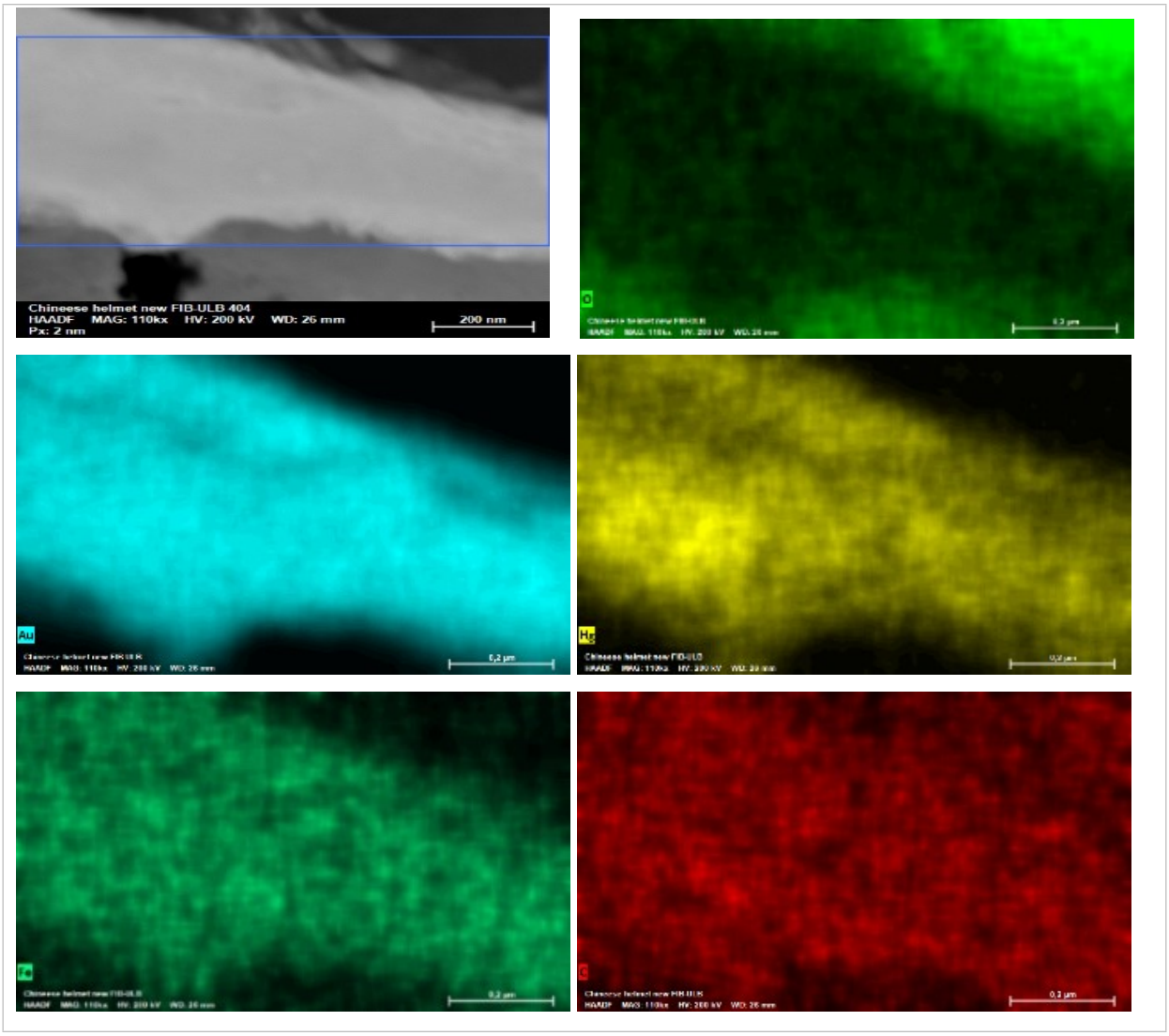
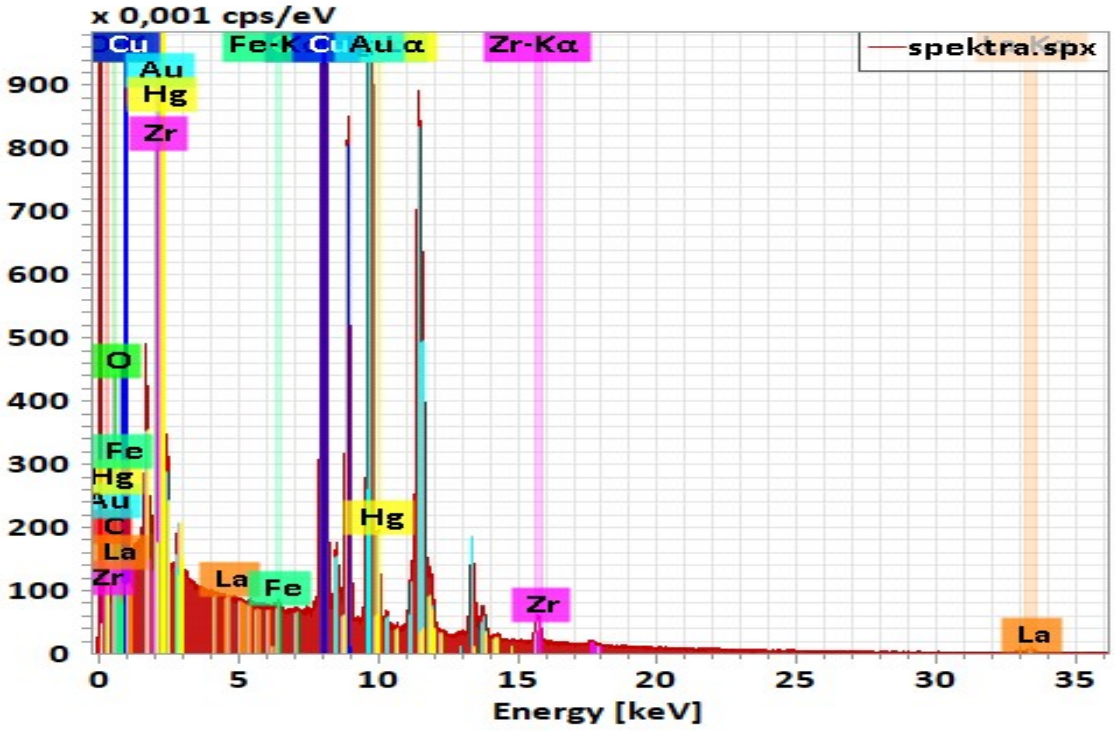
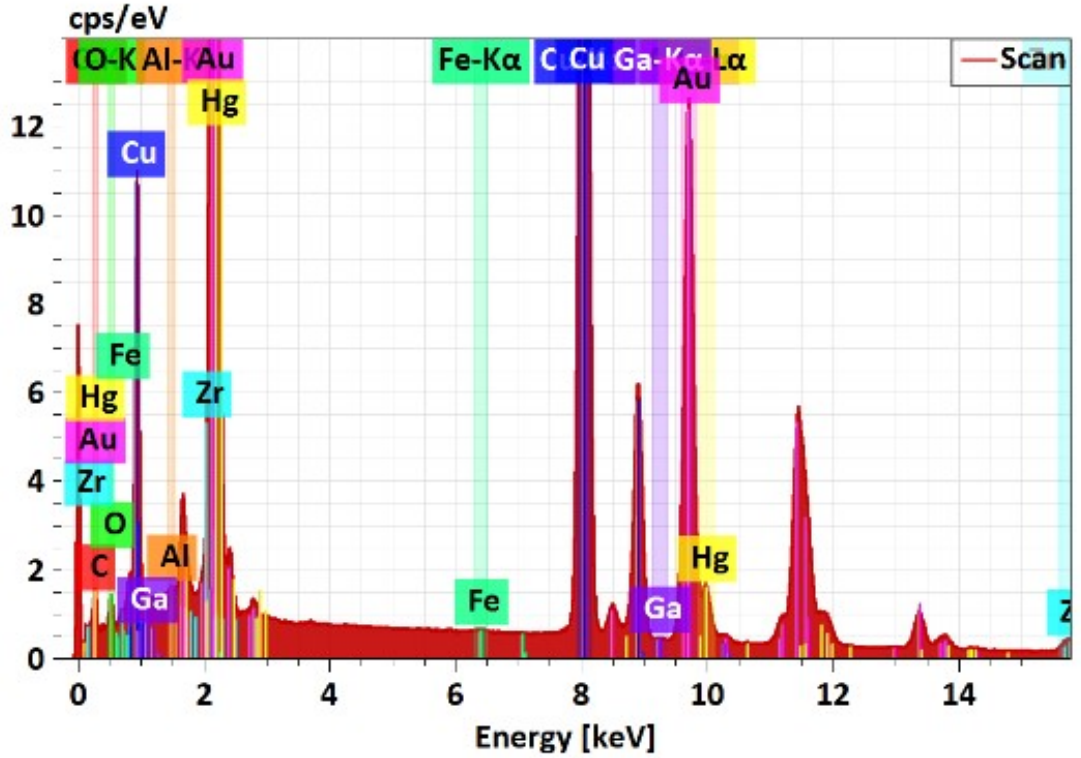
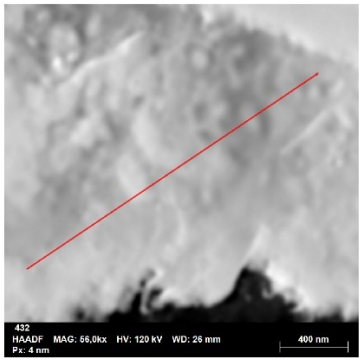


Fig. S1: TEM –EDS of 0-38 keV of the FIB cut shows the presence of Au in the thin gilding layer. Mapping of Fe, C, O, Au, is shown and Hg (yellow) is also detected, at 200nm scale. Upper (left) black and white photo is the High-angle annular dark-field imaging (HAADF) made by Scanning Transmission Electron Microscopy (STEM).


x 0,001 cps/eV
spektra.spx
Cu
Au
Hg
Zr
Fe-K
Au α
Zr-Kα
O
Fe
Hg
Au
C
La
Zr
La
Fe
Hg
Zr
La
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
35
Energy [keV]


cps/eV
Scan
O-K
Al-
Au
Hg
Cu
Fe-Kα
Cu
Ga-Kα
Au
Lα
Fe
Hg
Zr
Au
Zr
O
C
Al
Ga
Fe
Ga
Hg
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
Energy [keV]



Element	At. No.	Line s.	Netto	Mass Norm. [%]	Atom [%]	abs. error [%] (1 sigma)	rel. error [%] (1 sigma)
C	6	K-Serie	0	0,00	0,00	0,00	0,00
O	8	K-Serie	21921	0,19	2,14	0,03	16,54
Cu	29	K-Serie	11498239	0,00	0,00	0,00	0,00
Zr	40	K-Serie	110669	3,10	6,26	0,12	3,82
Au	79	L-Serie	6007550	86,32	80,66	8,66	10,03
Hg	80	L-Serie	681947	10,08	9,25	1,03	10,25
Al	13	K-Serie	40410	0,19	1,31	0,03	16,11
Fe	26	K-Serie	18792	0,12	0,39	0,03	24,32
Ga	31	K-Serie	0	0,00	0,00	0,00	0,00
			Sum	**100,00**	**100,00**		

Fig. S2 TEM –EDS spectra of 0-14 keV of the FIB cut shows chemical elements and the presence of Au and Hg in the thin layer film. Table gives the EDS chemical elements present. Data show that the layer is not homogeneous, it is probably of $Cu_7Au_3Hg_{0.2}$ composition.

S2: EBSD-SEM

Although EBSD measurements allowed to identify metallic copper and gold at the core metal, also tenorite, cuprite, malachite, azurite, nantokite, atacamite, brochantite, chalcocite and covellite were checked their presence at the core metal corrosion layer. Both EDS and EBSD mappings confirmed that core metal had been oxidized from inside into cuprite and developed a corrosion layer of malachite (Table S1). The data is from the Crystallography Open Database [49].

Table S1: Candidate phases used during this study.

Phase name	Space group	a(Å)	b (Å)	c (Å)	Mean Z
Cu	$Fm\bar{3}m$	3.58	-	-	29
Au	$Fm\bar{3}m$	4.07	-	-	79
CuO Tenorite	$C12/c1$	4.65	3.41	5.11	18.5
Cu_2O Cuprite	$Pn\bar{3}m$	4.25	-	-	22
$Cu_2CO_3(OH)_2$ Malachite	$P2_1/c$	9.502	11.974	3.240	
$Cu_3(CO_3)_2(OH)_2$ Azurite	$P2_1/c$	5.008	5.844	10.336	
Cu_2S Chalcocite	$P6_3/mmc$	3.89	-	6.88	