J. Braz. Chem. Soc., Vol. 25, No. 5, S1-S9, 2014.
Printed in Brazil - ©2014 Sociedade Brasileira de Química
0103 - 5053 $6.00+0.00

Supplementary Information

Nondestructive Determination of Allergenic and Toxic Elements in Jewelry: a Comparison of Benchtop and Portable Energy Dispersive X-Ray Fluorescence Spectrometers

José Augusto Da-Col,[a] Maria Izabel M. S. Bueno[a] and Fábio Luiz Melquiades*[*,b]

[a]*Instituto de Química, Universidade Estadual de Campinas, CP 6154, 13083-970 Campinas-SP, Brazil*

[b]*Departamento de Física, Universidade Estadual do Centro-Oeste, 85040-080 Guarapuava-PR, Brazil*

Appendix A

(a) Sample C07 (b) Sample C20

(c) Sample P06 (d) Sample C13

(e) Sample P19 (f) Body piercings

Figure S1. Necklace, bracelet and piercing samples used in the study for determination of Ni, Pb and other metals.

*e-mail: fmelquiades@unicentro.br

(a) Sample C16 (b) Sample C27

(c) Sample P15 (d) Sample P21

(e) Sample P36

Figure S2. Necklace and bracelet samples used in the study for the determination of noble metals Au and Ag.

Appendix B

This appendix contains concentration tables for the major elements present in jewelry samples. Tables, separated by sample types and equipment, show mean values and standard deviations (in parentheses).

Table S1. Elemental concentrations determined by the portable equipment (Innov-X Alpha 6500) for ring samples (g *per* 100 g, n = 3)

Sample	Ag	Cu	Fe	Ni	Pb	Sn	Ti	Zn
A1	–	6.7 (0.2)	–	86.3 (0.8)	4.4 (0.9)	2.6 (0.1)	–	–
A2	82 (16)	5 (1)	–	3.2 (0.3)	–	–	–	5.6 (0.5)
A3	71 (9)	2.4 (0.7)	2.1 (0.3)	–	–	–	20 (4)	–
A4	–	97 (2)	2 (2)	–	–	–	–	–
A5	–	48 (1)	–	26 (1)	16 (3)	7 (4)	–	–
A6	–	55 (2)	–	20 (2)	1.6 (0.4)	20 (2)	5 (1)	2.2 (0.3)

Table S2. Elemental concentrations determined by the portable equipment (Innov-X Alpha 6500) for earring samples (g *per* 100 g, n = 3)

Sample	Ag	Au	Cr	Cu	Fe	Ni	Pb	Zn
B1	–	–	–	25 (2)	7 (2)	12 (2)	–	–
B2	–	–	–	12.3 (0.9)	48 (1)	19 (1)	–	–
B3	–	–	–	56 (1)	–	–	–	23.8 (0.8)
B4	–	–	–	37.0 (0.8)	–	7.8 (0.5)	–	–
B5	–	–	–	46 (2)	18 (1)	–	–	4.8 (0.6)
B6	–	–	–	58 (1)	0.7 (0.2)	–	–	18.1 (0.7)
B7	–	–	–	62 (1)	–	–	–	12.2 (0.6)
B8	–	4.7 (0.5)	–	44 (4)	–	42 (6)	–	9 (2)
B9	–	–	–	18 (2)	46 (6)	35 (3)	–	–
B10	–	–	–	56 (1)	1.6 (0.3)	24 (1)	–	–
B11	–	–	15.4 (0.3)		39.9 (0.8)	–	–	–
B12	–	–	–	67 (4)	–	18 (7)	–	15 (3)
B13	27 (3)	–	–	53 (4)	–	8.1 (0.6)	1.5 (0.3)	6 (1)
B14	30 (2)	–	–	53 (3)	–	6.5 (0.9)	–	11 (2)
B15	–	17 (1)	–	64 (7)	0.7 (0.2)	–	–	12 (2)
B16	–	–	–	20 (7)	10 (4)	17.025 (0.007)	6 (2)	–
B17	–	–	–	44.3 (0.6)	–	43.3 (0.5)	–	12.44 (0.05)
B18	–	4 (1)	–	74 (2)	–	8.8 (0.2)	–	16 (1)
B19	–	8 (1)	–	58 (22)	–	21 (25)	3.6 (0.2)	17 (3)
B20	–	1.8 (0.3)	–	26 (11)	–	62 (19)	2 (1)	13 (2)
B21	–	2 (1)	–	14 (7)	–	84 (9)	0.5 (0.1)	–

Table S3. Elemental concentrations determined by the portable equipment (Innov-X Alpha 6500) for necklace samples (g *per* 100 g, n = 3)

Sample	Ag	Au	Cu	Fe	Ni	Pb	Sb	Sn	Ti	Zn
C01	–	–	54 (7)	42 (7)	–	–	–	–	–	–
	–	–	42 (1)	52.7 (0.9)	–	–	–	–	–	–
	–	–	44 (1)	–	–	–	–	–	–	–
C02	–	–	68 (1)	30.5 (0.5)	–	–	–	–	–	1.6 (0.2)
	–	–	95.5 (0.9)	–	–	–	–	–	–	1.4 (0.1)
	–	–	84 (1)	10.0 (0.4)	–	–	–	–	–	2.3 (0.2)
C03	–	–	2.1 (0.3)	–	–	–	–	–	–	–
	–	–	5.5 (0.5)	9 (1)	–	–	–	–	–	–
	–	–	3.1 (0.3)	4.91 (0.6)	–	–	–	–	–	–
C04	–	–	69 (1)	31.0 (0.6)	–	–	–	–	–	–
	–	–	95.5 (0.8)	0.17 (0.06)	–	–	–	–	–	1.3 (0.1)
	–	–	72.6 (0.9)	0.59 (0.09)	19.9 (0.5)	1.0 (0.2)	–	–	–	5.0 (0.3)
C05	–	–	60 (1)	38.2 (0.7)	–	–	–	–	–	–
	–	–	70.8 (0.7)	–	–	–	–	–	–	29.2 (0.4)
	–	–	75 (1)	14.2 (0.4)	–	–	–	–	–	11.2 (0.4)
C06	–	–	87 (1)	2.0 (0.2)	–	–	–	–	–	6.6 (0.3)
	–	–	43.5 (0.9)	–	–	–	–	–	–	50 (1)
	–	–	94 (1)	5.81 (0.3)	–	–	–	–	–	–

Table S3. continuation

Sample	Ag	Au	Cu	Fe	Ni	Pb	Sb	Sn	Ti	Zn
C07	–	–	66 (3)	21 (5)	5 (1)	–	–	–	–	4.7 (0.6)
C08	–	–	72.2 (0.9)	23.7 0.4	–	–	–	–	–	4.1 0.2
	–	–	4.38 (0.07)	59.3 (0.7)	31 (2)	–	–	–	–	5.4 (0.9)
C09	–	–	51.4 (0.9)	8.4 (0.3)	–	–	–	–	–	34.8 (0.7)
	–	–	70 (1)	17.5 (0.6)	–	–	–	–	–	4.3 (0.3)
	–	–	96.25 (0.8)	–	–	–	–	–	–	3.7 (0.2)
C10	–	–	31 (2)	–	–	–	–	–	–	–
	–	–	90.0 (0.9)	10.0 (0.3)	–	–	–	–	–	–
	–	–	100.0 (0.9)	–	–	–	–	–	–	–
C11	–	–	92 (1)	7.9 (0.3)	–	–	–	–	–	–
	–	–	54.1 (0.7)	1.1 (0.1)	–	–	–	–	–	44.8 (0.6)
	–	–	87 (1)	9.1 (0.3)	–	–	–	–	–	–
	–	–	80 (1)	11.1 (0.5)	–	–	–	–	–	–
C12	–	–	87 (1)	11.3 (0.3)	–	–	–	–	–	–
	–	–	100 (1)	–	–	–	–	–	–	–
C13	–	–	14 (1)	46 (2)	10 (1)	–	–	–	–	–
	–	–	42 (1)	–	5.4 (0.5)	–	–	–	–	13.0 (0.6)
	–	–	81.7 (0.9)	–	1.2 (0.2)	–	–	–	–	–
	–	–	84.1 (0.9)	–	1.2 (0.2)	–	–	–	–	–
	–	–	40.8 (0.9)	–	9.9 (0.6)	–	–	–	–	–
C14	–	–	74 (1)	3.1 (0.2)	–	–	–	–	–	21.4 (0.6)
	–	–	61 (1)	15.2 (0.6)	–	–	–	–	–	12.7 (0.5)
	–	–	83.0 (0.9)	4.3 (0.2)	–	–	–	–	–	11.6 (0.3)
	–	–	75 (1)	12.0 (0.4)	–	–	–	–	–	8.3 (0.4)
	–	–	54.6 (0.9)	41.0 (0.6)	–	–	–	–	–	4.4 (0.2)
	–	–	93.8 (0.9)	3.2 (0.2)	–	–	–	–	–	2.1 (0.1)
C16	81 (5)	–	3.2 (0.5)	–	13 (2)	–	–	–	7 (2)	–
C17	2.5 (0.2)	–	45 (3)	1.5 (0.4)	51 (3)	–	–	–	–	–
	2.20 (0.07)	–	57.9 (0.4)	–	32 (1)	0.8 (0.3)	–	2.9 (0.4)	4 (2)	–
C18	–	–	69.8 (0.4)	–	8.5 (0.5)	–	–	–	1.3 (0.4)	21 (2)
	–	–	69 (1)	–	9.4 (0.8)	–	–	–	2.3 (0.6)	–
C19	–	–	–	100 (29)	–	–	–	–	–	–
C20	3.2 (0.3)	–	65 (7)	–	21 (1)	–	–	–	10 (7)	2.7 (0.3)
	0.85 (0.02)	–	35 (1)	–	24 (2)	1.1 (0.2)	–	38.9 (0.3)	–	–
C21	–	–	57.7 (0.3)	–	14 (2)	–	–	–	–	28 (3)
	–	–	32.3 (0.3)	5.7 (0.7)	61.3 (0.8)	–	–	0.595 (0.007)	–	–
C22	–	–	–	26 (9)	74 (9)	–	–	–	–	–
C23	2.6 (0.4)	–	3.2 (0.5)	–	41.8 (0.4)	10.1 (0.4)	0.99 (0.33)	41.6 (0.5)	–	–
C24	66 (6)	–	15 (1)	–	–	–	–	–	17 (8)	1.9 (0.3)
C25	47 (6)	–	31 (3)	–	–	–	–	–	12 (9)	11 (1)
	18.3 (0.3)	–	61 (1)	–	–	–	–	–	6 (1)	14.4 (0.5)
C26	22 (2)	–	58 (1)	–	13.5 (0.1)	–	–	–	5 (3)	2.03 (0.05)
	12 (1)	–	28 (1)	–	9 (2)	9 (1)	–	42 (3)	–	1.9 (0.2)

Table S3. continuation

Sample	Ag	Au	Cu	Fe	Ni	Pb	Sb	Sn	Ti	Zn
C27	–	5.7 (0.3)	68 (2)	–	17 (1)	–	–	–	5 (1)	4.1 (0.2)
	–	4 (1)	49 (1)	–	26.2 (0.8)	–	–	–	8 (1)	12.2 (0.7)
	–	6.4 (0.9)	30.4 (0.8)	–	63 (1)	–	–	–	–	–
C28	3.2 (0.2)	–	25 (1)	20 (1)	31 (1)	–	–	–	20.0 (2)	–
	22.2 (0.3)	–	8.5 (0.4)	–	53 (1)	6.7 (0.4)	–	4.4 (0.3)	5 (1)	–
	5.7 (0.2)	–	5.5 (0.5)	–	59 (1)	17.9 (0.9)	2.3 (0.3)	–	9 (1)	–
	66.6 (0.8)	–	–	–	2.6 (0.4)	0.3 (0.1)	–	30 (1)	–	–
	58.5 (0.7)	–	1.7 (0.3)	–	3.7 (0.5)	0.5 (0.1)	–	35 (1)	–	–
C29	–	–	43 (5)	11 (1)	46 (6)	–	–	–	0.9 (0.3)	–
	–	–	–	10 (3)	–	–	–	–	90 (9)	–
	–	–	22.5 (0.3)	–	11 (1)	–	–	–	–	66 (1)
	–	–	49.8 (0.6)	–	4.1 (0.2)	–	–	–	1.4 (0.3)	44.7 (0.6)
	–	–	48.1 (0.5)	–	7.9 (0.2)	–	–	–	–	44.0 (0.6)
	–	–	30.6 (0.5)	–	18.4 (0.5)	42.7 (0.8)	6.1 (0.2)	2.2 (0.1)	–	–
	–	–	19.9 (0.4)	–	22.7 (0.5)	48.3 (0.8)	6.8 (0.2)	2.4 (0.1)	–	–

Table S4. Elemental concentrations determined by the portable equipment (Innov-X Alpha 6500) for bracelet samples (g *per* 100 g, n = 3)

Sample	Ag	Cu	Fe	Ni	Pb	Sb	Sn	W	Zn
P01	–	34 (15)	10.2 (0.3)	–	8.9 (0.9)	–	–	–	30 (6)
P02	–	71 (22)	0.5 (0.1)	23 (21)	–	–	–	–	4 (2)
P03	–	94.1 (0.9)	–	–	–	–	0.6 (0.1)	–	5.3 (0.2)
P04	–	73 (14)	–	–	–	–	0.5 (0.2)	–	26 (14)
P05	–	62.6 (0.5)	–	–	–	–	–	–	37.4 (0.5)
P06	–	52.3 (0.6)	1.7 (0.2)	0.82 (0.08)	7.1 (0.4)	–	1.3 (0.1)	–	36.7 (0.5)
	–	52.1 (0.6)	1.3 (0.1)	0.93 (0.08)	7.3 (0.4)	–	1.4 (0.1)	–	37.0 (0.5)
	–	53 (3)	1.5 (0.3)	0.87 (0.08)	8 (1)	–	1.35 (0.05)	–	38 (30)
P07	0.53 (0.04)	65.065 (0.007)	–	2 (1)	–	–	–	–	33.0 (0.7)
	–	64.0 (0.03)	–	0.9 (0.3)	–	–	–	–	35.08 (0.02)
P08	–	58 (2)	–	12 (3)	–	–	–	–	29 (1)
	–	61 (2)	–	3 (4)	–	–	–	–	35 (2)
P09	–	62 (1)	–	–	–	–	–	–	38 (1)
P10	–	85 (5)	1.0 (0.8)	13 (4)	–	–	–	–	–
P11	–	72 (3)	27 (2)	–	–	–	–	–	1.0 (0.2)
P12	1.0 (0.3)	66.0 (0.1)	–	13.5 (0.3)	–	–	–	–	19.4 (0.2)
P13	–	9.5 (0.5)	28.9 (0.6)	64 (5)	–	–	–	–	–
P14	4.9 (0.6)	49 (4)	–	37 (7)	–	–	–	–	9 (3)
P15	96 (1)	4 (1)	–	–	–	–	–	–	–
P16	–	–	71.4 (0.5)	8.5 (0.7)	–	–	–	–	–
P17	–	35 (2)	0.17 (0.03)	57 (4)	–	–	–	–	8 (1)
P18	63 (6)	25 (4)	–	3.02 (0.01)	–	–	–	–	8 (2)
P19	37.9 (0.2)	52.6 (0.4)	–	4.4 (0.4)	–	–	–	–	5.13 (0.07)

Table S4. continuation

Sample	Ag	Cu	Fe	Ni	Pb	Sb	Sn	W	Zn
P20	–	60 (2)	–	–	–	–	–	30 (2)	10 (3)
P21	–	49.6 (0.6)	–	–	–	–	–	42.9 (0.5)	7.5 (0.8)
P22	100 (1)	–	–	–	–	–	–	–	–
P23	–	–	71.9 (0.8)	9.1 (0.5)	–	–	–	–	–
P24	44 (4)	39 (2)	–	–	–	–	–	–	16 (2)
P25	–	29 (11)	–	67 (11)	–	–	–	3.7 (0.8)	–
P26	–	47 (10)	–	39 (15)	–	–	–	3.77 (0.04)	11 (7)
P27	95 (1)	5.0 (0.4)	–	–	–	–	–	–	–
	95.4 (0.2)	4.6 (0.2)	–	–	–	–	–	–	–
	96.3 (0.9)	3.7 (0.9)	–	–	–	–	–	–	–
P28	–	22 (2)	–	75 (3)	–	–	–	1.8 (0.8)	2.8 (0.3)
	–	30.7 (0.2)	–	65 (1)	–	–	–	1.2 (0.3)	–
P29	–	49 (2)	–	14.6 (0.4)	–	–	–	31 (3)	5.8 (0.8)
	–	46 (1)	–	26 (2)	–	–	–	28 (2)	–
P30	93.7 (0.4)	6.2 (0.4)	–	–	–	–	–	–	–
	92 (1)	7.8 (0.5)	–	–	–	–	–	–	–
P31	–	7.3 (0.4)	–	75 (2)	12 (1)	2.1 (0.1)	1.20 (0.05)	2.5 (0.2)	–
	–	16 (1)	–	28 (1)	48.1 (0.9)	4.0 (0.3)	2.4 (0.1)	1.3 (0.4)	–
P32	–	–	100 (28)	–	–	–	–	–	–
	–	31 (7)	–	68 (7)	–	–	–	–	–
	–	–	100 (24)	–	–	–	–	–	–
P33	40 (1)	53 (2)	–	–	–	–	–	–	6.4 (0.8)
	26.2 (0.1)	56.5 (0.3)	–	–	–	–	–	–	17.3 (0.4)
P34	–	89 (2)	–	10 (2)	–	0.695 (0.007)	–	–	–
	–	83 (2)	–	14 (1)	–	–	–	–	–
	–	96 (1)	–	4 (1)	–	–	–	–	–
	–	85.5 (0.3)	–	11.8 (0.7)	–	–	–	–	2.7 (0.5)
P35	–	22.9 (0.7)	–	–	7.2 (0.5)	–	44.9 (0.7)	25 (1)	–
	–	27 (1)	–	4.5 (0.2)	6.0 (0.3)	–	41 (2)	21.0 (0.5)	–
P36	40 (8)	37 (4)	–	12 (1)	–	–	–	–	10 (2)
	95.9 (0.6)	4.1 (0.6)	–	–	–	–	–	–	–
P37	7.21 (0.06)	82.4 (0.70)	3 (2)	–	–	–	–	–	7.7 (0.9)
	2 (1)	80 (12)	–	–	–	–	29.6 (0.4)	–	–
P38	–	25.3 (0.9)	42 (8)	–	8.1 (0.5)	–	–	–	33.7 (0.9)
P39	–	–	72 (1)	9.5 (0.8)	–	–	–	–	–
P40	–	66 (2)	–	11.7 (0.9)	–	–	–	–	22 (1)
P41	–	–	88.3 (0.5)	–	–	–	–	–	–
P42	–	68 (3)	–	11 (1)	–	–	–	–	19 (2)
P43	1.58 (0.09)	66.9 (0.5)	–	12.6 (0.7)	–	–	–	–	20 (1)
P44	–	58 (1)	–	42 (1)	–	–	–	–	–
P45	–	58.7 (0.3)	–	–	–	–	–	33.1 (0.6)	8.1 (0.3)
	–	60 (6)	–	–	–	–	–	26 (9)	21 (3)

Table S4. continuation

Sample	Ag	Cu	Fe	Ni	Pb	Sb	Sn	W	Zn
P46	4.45 (0.04)	38.9 (0.7)	–	18.1 (0.5)	2.5 (0.4)	–	36.0 (0.3)	–	–
	1.96 (0.05)	37.9 (0.7)	–	26 (3)	2.1 (0.5)	–	32 (3)	–	–
	7.5 (0.2)	19.4 (0.3)	–	40.5 (0.7)	1.2 (0.2)	–	31.3 (0.6)	–	–
P47	–	40.4 (0.3)	–	–	10.6 (0.4)	2.5 (0.2)	43.7 (0.4)	–	2.8 (0.1)
	–	23.8 (0.5)	–	–	20.9 (0.6)	1.9 (0.1)	49.3 (0.6)	–	4.1 (0.2)
P48	19.6 (0.7)	37.3 (0.6)	–	6 (1)	2.5 (0.4)	–	35 (2)	–	–
P49	–	41 (1)	3.26 (0.05)	12.9 (0.4)	18 (1)	0.86 (0.03)	0.58 (0.05)	–	22.89 (0.08)
P50	–	57.2 (0.9)	0.40 (0.04)	4 (1)	2.8 (0.4)	–	–	–	35.6 (0.8)
	–	55.7 (0.8)	0.30 (0.08)	5.3 (0.2)	2.9 (0.3)	–	–	–	35.8 (0.7)
P51	–	70 (2)	–	2.2 (0.8)	26 (3)	0.9 (0.1)	0.79 (0.06)	–	–
	–	83 (5)	–	13 (5)	1.3 (0.8)	0.9 (0.2)	1.06 (0.06)	–	–
P52	1.4 (0.2)	47 (9)	–	26 (4)	14 (3)	–	12 (1)	–	–

Table S5. Elemental concentrations determined by the benchtop equipment (Shimadzu, EDX700) for necklace samples (g *per* 100 g, n=3)

Sample	Ag	Au	Br	Ca	Cd	Cr	Cu	Fe	Ni	Pb	Sb	Sn	Zn
C01	–	–	–	3.1 (0.2)	–	–	66 (1)	26 (2)	–	–	–	5.4 (0.4)	–
	–	–	–	1.9 (0.7)	–	–	53 (9)	42 (10)	–	–	–	3 (1)	–
	–	–	5 (8)	5 (3)	–	–	78 (23)	–	–	–	–	9 (9)	–
C02	–	–	–	–	–	–	64 (12)	34 (12)	–	–	–	–	2.5 (0.7)
	–	–	5 (2)	–	–	–	87 (2)	–	0.21 (0.01)	–	5.7 (0.8)	–	1.7 (0.3)
C03	–	–	–	–	–	0.32 (0.06)	2 (1)	0.28 (0.05)	–	–	–	97 (1)	–
	–	–	–	10.7 (0.8)	–	–	28 (4)	16 (2)	–	–	–	49 (9)	–
	–	–	–	–	–	–	6 (3)	2 (2)	–	–	–	92 (5)	–
C04	–	–	–	–	–	–	85 (4)	13 (4)	–	–	–	–	2.6 (0.4)
	–	–	17 (6)	–	–	–	9 (2)	–	–	–	73 (6)	–	0.39 (0.07)
	–	–	–	–	–	–	79 (4)	–	17 (3)	–	–	–	3.0 (0.8)
C05	–	–	–	–	–	–	74 (9)	25 (9)	–	–	–	–	0.9 (0.3)
	–	–	–	–	–	–	99 (1)	–	–	–	–	0.25 (0.05)	–
C06	–	–	–	0.3 (0.2)	–	–	98 (1)	–	–	–	–	–	2 (1)
	–	–	–	–	–	–	95 (5)	–	–	–	–	–	6 (4)
C07	–	–	–	–	–	–	70 (7)	19 (7)	5 (1)	–	–	–	6 (1)
	–	–	–	–	–	–	84 (10)	–	1.9 (0.1)	–	–	–	6 (3)
C08	–	–	–	5 (3)	–	–	2 (1)	32 (24)	13 (14)	–	1 (1)	–	2 (1)
	–	–	–	–	–	–	80 (3)	12 (3)	–	–	–	–	7.2 (0.7)
C09	–	–	–	–	–	–	86 (3)	5 (2)	–	–	–	–	9.0 (0.9)
	–	–	2.1 (0.8)	–	–	–	80.9 (0.2)	–	–	–	13.9 (0.6)	–	3 (1)
C10	–	–	–	0.2 (0.1)	–	–	99.77 (0.09)	–	–	–	–	–	–
C11	–	–	–	0.2 (0.2)	–	–	90 (3)	10 (3)	–	–	–	–	–
	0.41 (0.04)	–	–	0.52 (0.08)	–	–	99.1 (0.1)	–	–	–	–	–	–
C12	–	–	–	–	–	–	99.7 0.3	–	–	–	–	–	–

Table S5. continuation

Sample	Ag	Au	Br	Ca	Cd	Cr	Cu	Fe	Ni	Pb	Sb	Sn	Zn
C13	–	–	–	–	–	–	37.6 (0.8)	–	10.8 (0.3)	–	–	31 (1)	11.8 (0.3)
	–	–	25 (7)	–	–	–	4 (1)	–		–	64 (8)	7 (2)	–
	–	–	3.8 (0.5)	8 (1)	–	–	46 (1)	–	14 (1)	–	3.17 (0.09)	25 (4)	1.0 (0.2)
	–	–	–	–	–	0.27 (0.02)	76 (3)	–	4.3 (0.7)	–	–	17 (1)	–
C14	–	–	–	–	–	–	77 (2)	6 (1)	–	–	–	–	17 (1)
	–	–	–	–	–	–	80 (2)	–	–	–	–	–	19 (2)
	–	–	0.8 (0.5)	–	–	–	68 (42)	–	–	–	27 (45)	–	5 (2)
	–	–	–	–	–	–	63 (2)	29 (2)	–	–	–	–	8 (1)
C15	–	–	–	–	–	1.8 (0.2)	–	14 (2)	–	–	–	–	2.5 (0.9)
C16	75.2 (0.8)	–	–	–	–	–	3.0 (0.1)	0.16 (0.02)	21.1 (0.7)	–	–	–	0.31 (0.05)
C17	3 (1)	–	–	–	–	–	–	0.4 (0.5)	95 (2)	–	–	–	–
	1.76 (0.03)	–	–	–	0.16 (0.02)	–	42.5 (0.3)	–	52.1 (0.2)	–	0.18 (0.02)	2.7 (0.2)	–
C18	–	–	–	–	–	–	74 (2)	–	25 (2)	–	–	–	–
	–	–	–	–	–	–	68 (2)	–	19 (3)	–	–	–	13 (1)
C19	–	–	–	–	–	3.24 (0.08)	1.8 (0.3)	19 (3)	–	–	–	–	3.2 (0.7)
C20	5.8 (0.2)	–	–	–	–	–	49 (3)	–	45 (2)	–	–	–	0.39 (0.08)
	1.37 (0.07)	–	–	–	1.1 (0.1)	–	41 (2)	–	26 (2)	0.99 (0.02)	–	29 (0.7)	–
C21	–	–	–	0.12 (0.08)	–	–	–	3.1 (0.3)	96.7 (0.4)	–	–	0.18 (0.03)	–
C22	–	–	–	–	–	–	–	16 (2)	84 (2)	–	–	–	–
C23	1.8 (0.3)	–	–	0.18 (0.09)	0.67 (0.01)	–	3.9 (0.6)	0.12 (0.02)	55 (3)	8.5 (0.3)	0.3 (0.1)	29 (3)	0.41 (0.08)
C26	30.5 (0.4)	–	–	–	–	–	47 (1)	–	20 (0.7)	–	–	–	–
	13.2 (0.9)	–	–	–	1.6 (0.2)	–	31 (2)	–	10.6 (0.7)	5.8 (0.4)	0.79 (0.05)	37 (3)	–
C27	–	3.4 (0.4)	–	–	–	–	61 (2)	–	31 (2)	–	–	–	4.2 (0.2)
	–	4 (2)	2.2 (0.9)	–	1.9 (0.1)	–	49.8 (0.1)	0.238 (0.001)	75 (27)	–	1.4 (0.5)	–	–
C28	74 (2)	–	–	–	0.67 (0.04)	–	–	0.25 (0.02)	1.0 (0.1)	–	–	25 (2)	–
	30 (2)	–	–	–	–	–	–	0.265 (0.005)	61 (2)	4.09 (0.06)	1.8 (0.3)	4.1 (0.3)	–

Table S6. Elemental concentrations determined by the benchtop equipment (Shimadzu, EDX700) for bracelet samples (g *per* 100 g, n=3)

Sample	Ag	Au	Cd	Cr	Cu	Fe	Mn	Ni	Pb	Pt	Sn	Zn
P01	–	–	–	0.009 (0.005)	0.24 (0.05)	0.18 (0.04)	0.027 (0.006)	0.02 (0.01)	0.015 (0.005)	–	–	0.29 (0.06)
P02	–	–	–	–	82 (7)	0.6 (0.2)	0.13 (0.01)	13 (5)	0.41 (0.04)	–	–	4 (1)
P03	–	–	–	–	98.4 (0.5)	–	–	–	–	–	0.41 (0.06)	0.9 (0.2)
P04	–	–	–	–	99 (0.3)	–	–	0.14 (0.04)	–	–	0.35 (0.04)	–
P05	–	–	–	–	63 (1)	–	0.08 (0.01)	–	–	–	–	37 (1)
P06	–	–	–	–	52 (0.1)	1.16 (0.03)	–	0.78 (0.02)	4.1 (0.1)	–	0.73 (0.08)	40.6 (0.3)
P08	0.20 (0.03)	–	0.21 (0.01)	–	52 (2)	–	–	23 (3)	–	–	–	24 (1)
	0.16 (0.02)	–	–	–	56 (2)	–	–	18 (5)	–	–	0.38 (0.06)	26 (3)
P09	–	–	–	–	61.2 (0.6)	–	0.102 (0.005)	–	–	–	0.11 (0.01)	38.1 (0.4)
P10	–	–	–	–	62 (7)	2 (1)	–	36 (8)	–	–	–	–
P11	–	–	–	–	85 (1)	13 (1)	–	–	–	–	–	2.0 (0.5)

Table S6. continuation

Sample	Ag	Au	Cd	Cr	Cu	Fe	Mn	Ni	Pb	Pt	Sn	Zn
P12	–	–	–	–	65 (1)	–	0.31 (0.02)	13.7 (0.1)	–	–	–	20.3 (0.7)
P13	0.17 (0.02)	–	–	–	4.7 (0.4)	10.1 (0.3)	–	85.0 (0.6)	–	–	–	–
P14	4.2 (0.2)	–	–	–	32 (1)	–	0.09 (0.02)	60 (2)	–	–	–	4 (1)
P15	93.7 (0.5)	–	–	0.36 (0.04)	5.8 (0.3)	–	–	–	–	–	–	0.180 (0.002)
P16	–	–	–	19.47 (0.07)	0.20 (0.03)	70.0 (0.1)	1.55 (0.04)	8.52 (0.03)	–	0.17 (0.02)	–	–
P17	–	–	–	–	17 (1)	0.27 (0.02)	–	79 (1)	–	–	–	3.0 (0.4)
P18	81 (2)	–	–	–	14 (2)	–	–	2.2 (0.2)	–	–	–	–
P19	39 (3)	–	–	0.60 (0.09)	53 (2)	–	–	7.0 (0.2)	–	–	–	–
P20	–	25.5 (0.4)	0.66 (0.02)	–	63.7 (0.4)	–	–	–	–	–	–	8.8 (0.7)
P21	–	39 (2)	0.93 (0.08)	–	51.4 (0.6)	–	–	–	–	–	–	6.6 (0.9)
P22	98.7 (0.1)	–	–	–	0.60 (0.06)	0.30 (0.02)	–	–	–	–	–	0.11 (0.01)
	94 (4)	–	–	0.239 (0.009)	5 (3)	–	–	–	–	–	–	0.52 (0.05)
P23	–	0.07 (0.01)	–	19.5 (0.4)	–	71.5 (0.3)	–	8.8 (0.1)	–	0.14 (0.02)	–	–
P24	53 (3)	–	–	0.192 (0.004)	46 (3)	–	–	–	–	–	–	–
	34 (5)	–	–	0.22 (0.03)	43 (3)	0.33 (0.02)	–	–	1.1 (0.1)	–	–	20 (2)
P25	–	2.9 (0.4)	–	–	–	0.08 (0.01)	0.11 (0.02)	96.7 (0.6)	–	–	–	–
	–	1.3 (0.1)	–	–	–	0.10 (0.02)	–	98.3 (0.1)	–	–	0.17 (0.04)	–
P26	0.31 (0.04)	–	–	–	59 (2)	–	–	17 (2)	–	–	–	24 (1)
P28	–	2.0 (0.7)	–	–	–	0.12 (0.03)	–	97 (2)	–	–	–	2.92 (0.07)
	–	1.4 (0.1)	–	–	–	0.10 (0.01)	–	98.3 (0.1)	–	–	–	0.210 (0.002)
P29	0.37 (0.09)	27 (4)	–	–	34 (4)	–	–	38.1 (0.3)	–	–	–	–
	0.157 (0.004)	12.8 (0.1)	–	–	50.3 (0.5)	–	–	28.2 (0.2)	–	–	–	8.32 (0.04)
P34	–	–	–	–	78.0 (0.5)	–	–	21.8 (0.5)	–	–	–	–
	–	–	–	–	77.6 (0.7)	–	–	18.0 (0.5)	–	–	–	–
	–	–	–	–	81 (1)	–	–	16.2 (0.9)	–	–	–	–
P35	0.26 (0.02)	22.5 (0.3)	1.62 (0.06)	–	32.4 (0.3)	0.16 (0.02)	–	–	3.6 (0.2)	–	39.0 (0.2)	0.42 (0.02)
P36	42 (7)	–	–	–	32 (7)	–	–	15 (2)	–	–	–	11 (3)
P39	–	–	–	19.4 (0.2)	0.213 (0.008)	67.1 (0.3)	0.9 (0.2)	8.1 (0.2)	–	–	–	–
P42	–	–	–	–	64.8 (0.2)	0.1164	0.37 (0.02)	11.7 (0.3)	–	–	0.1070 (0.0003)	23.0 (0.5)
P43	0.80 (0.05)	–	–	–	64.0 (0.1)	–	0.30 (0.01)	11.9 (0.1)	–	–	–	22.9 (0.2)
P46	7.6 (0.5)	–	2.3 (0.1)	0.11 (0.02)	–	0.16 (0.01)	–	65.3 (0.8)	–	–	24.6 (0.4)	–
	2.7 (0.2)	–	2.3 (0.1)	–	–	0.1558	–	67 (2)	0.78 (0.08)	–	27 (2)	–
P47	–	–	–	–	58 (2)	–	–	–	4.8 (0.4)	–	28 (2)	6.1 (0.4)
P48	37 (14)	–	0.87 (0.04)	0.23 (0.03)	33.3 (0.5)	–	–	8 (2)	–	–	29.16 (0.03)	–
P49	–	–	–	–	31.8 (0.8)	–	–	23.6 (0.1)	24 (2)	–	1.0 (0.2)	16 (1)
P50	–	–	–	–	54 (0.1)	–	–	6.6 (0.6)	2.00 (0.09)	–	0.15 (0.02)	36.6 (0.6)
P51	–	–	–	–	91.1 (0.2)	–	–	1.3 (0.2)	5.5 (0.1)	–	0.49 (0.04)	–
P52	0.82 (0.08)	–	0.74 (0.06)	–	53.5 (0.2)	–	–	35.8 (0.6)	3.1 (0.4)	–	6.19 (0.04)	–