

**China and the steppe: technological study of precious metalwork from Xigoupan Tomb 2
(4th-3rd c. BCE) in the Ordos Region, Inner Mongolia**

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Additional file 1:

Elemental composition (wt%) of gold artefacts in the Iron Age China and Central Asia

Part I: China, 8th-3rd century BCE

Object	Number of analysis	Date (c.BCE)	Au	Ag	Cu	Pb	Fe	Sn	Archaeological site	Source
gold leaf 01	1	8th-5th	90.6	9.4					Dabuzishan M3, Lixian, Gansu	Yang et al. 2017, 105
gold leaf 02	1		92.1	7.9						
gold leaf 03	1		91.8		0.1		7.1		Gansu provincial Museum holdings	
gold leaf 04	1		75.4	22.8	1.4		0.1			
gold leaf 05	1		65.1	33.0	1.3		0.2			
gold leaf 06	1		85.3	13.0	0.3		1.1			
gold sheep and tiger (T16 K6:6)	1	5th-4th	90.1	8.8	0.1		0.6		Majiazhuang, Shaanxi	Yang et al. 2017, 109
decoration (T16:46-1)	1		90.5	9.0	0.1		0.3			
horse harness ornament (M1:44-1)	1		86.8	11.1	0.23		1.43			
horse harness ornament (M1:44-2)	1		87.9	9.9	0.23		1.03			
gold ornament M1:45	1		90.0	6.6	1.3		0.7			
gold pao-ornament (86 M1:1042)	1	5th-4th	89.7	9.8	0.1		0.3		Fengxiang, Shaanxi	Yang et al.2017, 109
gold spring-shaped wire 01			88.7	10.4	0.1		0.4			
gold spring-shaped wire 02	1		88.8	9.9	0.1		0.8			
gold pao-ornament (86 M1:1189)	1		88.7	10.1	0.3		0.5			
gold pao ornament (85 M1:335)	1		91.5	7.6	0.2		0.2			
gold ornament (86 M1: 493)	1		82.9	16.5	0.1		0.3			
gold ornament (86 M1: 1164)	1		80.9	16.0	0.2		2.1			
gold ornament (M1: 37)	1		89.7	9.7	0.2		0.2			

gold ornament (M1:38)	1	5th-4th	77.5	7.7	0.2		10.0		Fengxiang, Shaanxi	Yang et al.2017, 109
strip-shaped gold leaf (M1:22)	1		89.6	9.0	0.1		0.5			
gold leaf (M1)	1		91.9	7.6	0.2		0.2			
gold ornament (M1:51)	1		89.6	6.8	2.2		0.2			
gold ornament (M185:50)	1		88.3	8.5	1.8		0.4			
gold ornament (M118:49)	1		85.9	9.3	0.3		2.1			
gold ornament (M162:48-3)	1	8th-5th	90.8	7.1	0.3		0.1		Fengxi, Shaanxi	Yang et al.2017, 109
gold plaque with decoration (M162:48-2)	1		85.7	6.8	0.3		1.2			
gold decoration (M162:48-1)	1		90.2	7.5	0.3		1.0			
gold plaque BYM2:26	1	6th-5th	84.5	14.3	0.3		0.8		Yimencun, Shaanxi	Yang et al.2017, 116
gold plaque BYM2:29	1		84.2	14.4	0.4		0.7			
gold plaque BYM2:32	1		89.8	9.7	0.1		0.3			
gold plaque BYM2:45	1		89.5	8.8	0.3		0.1			
gold plaque BYM2:47	1		90.4	9.1	0.2		0.1			
gold plaque BYM2:52	1		87.6	9.9	0.1		0.4			
gold plaque BYM2:53	1		88.8	10.6			0.4			
gold plaque BYM2:73	1		90.1	9.2	0.3		0.2			
duck-head-shaped hook 01	1		90.0	8.6	0.8		0.3			
duck-head-shaped hook 02	1		89.6	9.1	0.4		0.2			
gold bead 1	1		90.0	9.0	0.3		0.2			
gold bead 2 (M2:101)	1		91.1	8.2	0.2		0.1			
gold bead 3	1		91.2	8.1	0.4		0.1			
gold bead 4 (M2:101)	1		90.5	9.2	0.1		0.1			
gold bead 5 (M2:101)	1		90.6	9.2	0.1		0.1			
She (M27:1235)	1	8th	92.9-93.5	5.5-6.1	1.0				Liangdaicun M27, Shaanxi	Yang et al.2017, 123
armlet (M27:1246)	1		96.5-97.1	2.9-3.5						
small gold bulb (M27:1225)	1		93.8-93.9	6.1-6.2						
large gold bulb (M27:1202)	1		94.9	5.1						
Ge-sword (M27:1222)	1		93.7-94.7	5.3-6.3						
Ox-head with a ring (M27:1207)	1		93.9-96.6	3.4-6.1						

animal-shaped object (M27:1241)	1		94.4-96	4.0-5.6					Liangdaicun M27, Shaanxi	Yang et al.2017, 123
gold ring (M27:1217)	1		94.5-95.0	5.0-5.5						
sword sheath (M27:1221)	1		94.8	5.2						
gold appliqué with ram's head XG1:29	1	4th-3rd	93.0	7.0					Xigou M1, Xinjiang	Tan et al. 2016,86
gold appliqué with ram's head XG1:41	1		95.8	4.2						
tiger appliqué XG1:23	1		92.4	7.6						
tiger appliqué XG1:27	1		95.4	4.6						
rectangular gold foil XG1:49	1		92.8	7.2						
rectangular gold foil XG1:57	1		78.9	21.1						
triangular gold foil XG1:60	1		82.8	15.3	1.9					
triangular gold foil XG1:51	1		73.4	26.6						
tear-drop gold foil XG1:50	1		82.2	16.1	1.6					
gold plate with eagle's head XG1:36	1		71.9	28.1						
MJY57 gold plaque 01	1	4th-3rd	91.4	8.6					Majiayuan, Gansu	Huang & Chen 2013, 57
MJY57 gold plaque 02	1		91.1	7.9						
MJY57 gold plaque 03	1		89.9	10.1						
MJY16 gold torc	1		83.6	12.8	0.4					
MJY16 gold belt buckle	1		88.8	8.9	0.6					
MJY16 gold belt plaque 01	1		81.2	13	0.8					
MJY16 gold belt plaque 02	1		86.0	9.2	0.8					
MJY16 gold belt plaque 03	1		83.8	14.0	1.3					
MJY16 gold belt plaque 04	1		86.0	10.2	0.5					
MJY16 gold plate	1		83.2	13.7	0.3					
MJY16 gold hair ornament	1		89.9	8.3	1.0					

MJY16 Chariot decoration 01	1	4th-3rd	77.4	18.4	0.7				Majiayuan, Gansu	Huang & Chen 2013, 57
MJY16 Chariot decoration 02	1		73.3	22.9	0.9					
QS2390-2 gold appliqué	1	4th-3rd	89.7	6.3	0.1	1.5	2.4		Qingshui, Gansu	Gansu 2014, 27, 24
QS2390-3 gold appliqué	1		90.9	8.2	0.1	0.4	0.4			
QS2390-4 gold appliqué	1		88.1	10.8	0.1	0.3	0.8			
QS2390-5 appliqué	1		92.2	6.3	0.3	0.6	0.6			
QS950 appliqué	1		88.2	10.7	0.2	0.1	0.8			
QS951 appliqué	1		90.5	8.0	0.3		1.2			
QS952 appliqué	1		87.7	11.8	0.1	0.2	0.2			
QS953 appliqué	1		90.9	7.8	0.3		1.0			
QS954 appliqué	1		88.4	10.9	0.2	0.2	0.3			
QS955 appliqué	1		86.4	12.9	0.1	0.1	0.5			
QS956 appliqué	1		89.9	9.4	0.5	0.2				
QS957 appliqué	1		87.7	5.9	0.4		6.1			
QS958 appliqué	1		87.1	12.3	0.2	0.1	0.3			
QS959 appliqué	1		92.3	6.3	0.5		0.9			
QS960 appliqué	1		90.9	8.6	0.2	0.1	0.2			
QS961 appliqué	1		89.6	9.8	0.2	0.2	0.2			
QS2007 appliqué	1		76.8	22.5	0.5	0.1	0.1			
QS2008-1 appliqué	1		77.7	21.6	0.4	0.2	0.1			
QS2008-2 appliqué	1		79.5	19.6	0.5	0.2	0.2			
QS1397 appliqué	1		82.4	16.6	0.3	0.2	0.4			
QS1417 appliqué	1		87.0	11.7	0.3	0.1	0.9			
QS1418 appliqué	1		86.7	11.7	0.3	0.2	1.0			
QS1419 appliqué	1		86.7	11.8	0.3		1.3			
QS1420 appliqué	1		85.9	11.7	0.3		2.1			
QS947 appliqué	1		90.8	8.2	0.5		0.5			
QS948 appliqué	1		86.0	12.1	0.4		1.5			
QS949 appliqué	1		90.4	8.6	0.4		0.6			
plaque with reclining horse	1	4th-3rd	86.8	13.2					Xigoupan, Inner Mongolia	analyzed by the authors
deer appliqué	1		81.8	16.8	1.4					
appliqué with confronting beasts	1		89.3	10.7						
eagle appliqué	1		90.0	9.6	0.4					
gold belt plaque XGPM2:26	1	4th-3rd	88.6	10.9	0.1		0.2	0.1	Xigoupan, Inner Mongolia	Wang et al. 2015, 122
gold belt plaque XGPM2:27	1		88.7	10.6	0.2	0.1	0.3	0.1		

torc XGP M2:28	1		92.6	7.0	0.2		0.2		Xigoupan, Inner Mongolia	Wang et al. 2015, 122
ornament XGPM2:30	1		88.8	9.9	0.2		0.3	0.2		
earring XGPM2:31	1		88.9	9.2	1.2		0.3			
eagle-shaped gold plaque 01	1		86.8	11.3	0.7	0.4	0.5	0.1		
eagle-shaped gold plaque 02	1		86.6	11.3	0.8		0.4	0.1		
eagle-shaped gold plaque 03	1		86.6	11.3	0.7	0.3	0.6	0.1		
eagle-shaped gold plaque 04	1		86.7	11.3	0.6	0.4	0.7	0.2		
eagle-shaped gold plaque 05	1		87.0	11.3	0.7	0.4	0.5	0.1		
eagle-shaped gold plaque 06	1		75.3	21.3	1.8	0.5	0.9	0.1		
semispherical plaque 01	1		52.6	41.2	5.5	0.1	0.1	0.2		
semispherical plaque 02	1		52.8	41.2	5.1	0.1	0.3	0.3		
semispherical plaque 03	1		53.1	41.7	4.6	0.1	0.2	0.3		
semispherical plaque 04	1		52.5	41.1	5.9	0.1	0.2	0.2		
semispherical plaque 05	1		53.9	40.1	5.2	0.1	0.3	0.2		
belt plaque with animal combat 01	1	4th-3rd	91.2	7.4	0.7		0.4	0.2	Nianfangqu, Inner Mongolia	Wang et al. 2015, 123
belt plaque with animal combat 02	1		91.6	7.1	0.6		0.3	0.1		
gold ring	1		80.8	15.1	0.1		2.4	0.2		
gold beads	1		84.6	13.2	1.5		0.2			
gold plaque in the form of beast's head 01	1		64.7	12.3	0.8		11.2	0.2		
gold plaque in the form of confronting dragons 01	1		87.9	10.0	0.8		0.9	0.3		
gold plaque in the form of confronting dragons 02	1		88.0	9.7	0.7	0.1	0.7	0.3		
gold plaque in the form of confronting dragons 03	1		88.2	9.8	0.8		0.9	0.3		
gold plaque in the form of confronting dragons 04	1		88.2	10.0	0.9		0.7	0.3		

gold plaque in the form of confronting dragons 05	1		88.7	10.0	0.8		1.0	0.3	Nianfangqu, Inner Mongolia	
accordion-shaped ornament 01	1		89.0	9.1	0.7		0.7			
accordion-shaped ornament 02	1		87.2	10.9	0.6	0.1	0.8			
accordion-shaped ornament 03	1		84.8	12.4	1.0		1.1			
rectangular belt plaque	1	4th-3rd	84.7	13.3	0.5		0.4	0.2	Baijiawan, Inner Mongolia	Cao et al. 2019, 114
cone-shaped ornament 01	1		91.0	6.6	1.0		0.3			
cone-shaped ornament 02	1		93.6	4.3	0.7		0.2	0.2		
accordion-shaped ornament	1		89.3	8.2	1.2		0.2	0.2		
corrugated ornament	1		87.3	10.5	0.7		0.5	0.2		
small ring	1		93.2	3.5	0.5		1.2	0.3		

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Elemental composition (wt%) of gold artefacts in the Iron Age China and Central Asia

Part II: Central Asia, 8th-3rd century BCE

Object	Number of analysis	Date (c.BCE)	Au	Ag	Cu	Pb	Fe	Sn	Archaeological site	Source
gold object 2326/9	1	6th-5th	95.1-95.6	4.2-4.8	0.1-0.3				Chilikta-5, Altai	Marsadolov & Khavrin 2013, 134-135
gold loop 2326/9	1		94.6-95.0	4.6-5.0	0.3-0.4					
deer plaque 2326/1-3	1		94.9-95.8	3.9-4.8	0.2-0.4					
deer plaque 2326/1-1	1		92.7--93.3	6.5-7.0	0.2-0.4					
deer plaque 2326/1-2	1		92.6-93.1	6.7-7.1	0.1-0.4					
deer plaque 2326/1-6	1		92.4-93.2	6.5-7.4	0.1-0.4					
gold plate 2326/6	1		93.1-94.6	5.2-6.5	0.1-0.5					
gold grain 2326/6	1		86.5-92.3	6.7-11.9	0.8-1.6					
eagle headed appliqué	1		87.8-91.4	8.4-11.2	0.1-1.6					
gold foil 2830/25	1	7th	89.2-89.5	9.4-9.8	1.0-1.2				Arzhan II, k12, Tuva	Zaikov & Chugunov 2015,145
gold foil 2830/25	1		89.7-90.0	8.8-9.1	1.0-1.4					
gold foil 2830/27	1		87.2-87.6	11.9-12.1	0.5-0.8					
gold foil 2830/37	1		71.4-77.5	21.3-27.5	1.0-2.5					
gold foil Ap2-Ko	1		86.7	12.81	0.42					
gold foil ARZ-2-1-F	1		90.87	7.49	1.22					
gold foil ARZ-2-2-F	1		83.58	15.4	0.83					
gold foil ARZ-2-7-F2	1		78.5	15.64	5.45					
gold foil ARZ-2-2-F2	1		80.57	13.99	5.0					
beads	3		83.85	14.9	1.04					
pectoral fragment 2830/37	1									
earring 2830/1	1	7th	85.9-87.2	11.8-13.1	0.9-1.1				Arzhan II, k7, Tuva	
gold foil 1793/422	1	6th-5th	80.0-85.0	14.0-16.0	1.0-3.0				Bashadar-2, Altai	Marsadolov & Khavrin 2013, 134-135
gold foil 1793/743	1			65.7-66.3	31.9-32.5	1.5-1.9				

eagle appliqué 2824/1	1	6th-5th	81.2-82.0	15.6-16.3	2.3-2.7				Bashadar k9, Altai	
eagle appliqué 2824/4	1		81.3-81.7	15.8-16.3	2.3-2.7					
eagle appliqué 2824/5	1		82.1-82.4	14.8-15.7	2-2.8					
hemispherical appliqué 2824/6	1		65.1-69.3	28.2-32.2	2.1-2.7					
hemispherical appliqué 2824/7	1		84.0-85.3	12.7-14.2	1.7-2.0					
ibex plaque 2824/16	1	6th-5th	77.4-81.6	16.8-19.8	1.6-3.0				Bashadar k10, Altai	
ibex plaque 2824/17	1		80.3-81.3	16.6-17.6	1.8-2.2					
hemispherical appliqué 2824/18	1		81.5-83.6	14.7-16.1	1.5-2.6					
horse headband 2824/20	1		79.6-83.5	14.5-16.7	1.9-2.2					
horse tail 2824/21	1		85.8-86.6	11.6-12.1	1.8-2.4					
gold foil in the form of predator's head 2811/28	1	5th-3rd	73.0-73.6	23.4-23.8	3.0-3.2				Katonsky, k5, Altai	
gold foil in the form of predator's head 2811/29	1		74.7-75.1	22.6-22.8	2.3-2.6					
corrugated tube T2-II1	3	7th-6th	92.3	6.9	0.4			0.1	Taldy II, burial mound 2, Kazakhstan	Beisenov & Tairov 2015, 23-24
corrugated tube T2-II2	4		84.0	14.6	1.2					
corrugated tube T2-II3	2		82.1	16.5	0.8			0.2		
corrugated tube T2-II4	4		91.7	6.5	0.9			0.2		
corrugated tube T2-II5	4		92.5	5.9	0.4			0.4		
corrugated tube T2-II6	4		89.1	9.5	0.5			0.4		
corrugated tube T2-II7	4		90.3	7.8	1.5			0.1		
corrugated tube T2-II8	2		97.0	7.8	1.8					

corrugated tube T2-II9	5	7th-6th	90.2	8.1	0.7			0.2	Taldy II, burial mound 2, Kazakhstan	Beisenov & Tairov 2015, 23-24
appliqué in the form of argali head T2-A-1	1		92.1	7.6						
appliqué in the form of argali head T2-A-2	4		86.7	12.0	0.9					
appliqué in the form of argali head T2-A-3	5		87.1	12.2	0.2			0.1		
eagle appliqué T2-Op	1		87.9	10.3	0.8			0.6		
belt clip 01	4	7th-6th	88.3	11.0	0.6			0.1	Taldy II, burial mound 5, Kazakhstan	Beisenov & Tairov 2015, 23-24
belt clip 02	2		87.4	11.7	0.7			0.2		
belt clip 03	4		85.1	14.1	0.8			0.1		
belt clip 04	4		88.3	11.1	0.5					
belt clip 05	4		85.2	13.9	0.8			0.1		
belt clip 06	4		86.5	12.5	0.7			0.3		
belt clip 07	4		88.2	11.2	0.6					
belt clip 08	3		78.9	20.2	0.9					
belt buckle T2	4		83.7	15.3	0.7			0.3		
cone-shaped object T2-b6	3		89.1	10.3	0.4					
roundel 01 T2-BM1	1		85.0	13.3	1.6					
roundel 02 T2-BM2	1		84.8	13.5	0.8			0.5		
roundel 03 T2-BM3	3		84.9	14.0	0.9					
roundel 04 T2-BM4	3		85.5	13.4	0.9					
pendant earring T2-C	4		92.8	6.0	1.0					
clip belt 01 T2-O1	3		92.1	7.4				0.2		
clip belt 01 T2-O2	3		92.6	7.2						
curly plaque	4		79.5	19.2	1.0			0.2		
predator plaque T2-H1	3		74.3	24.8	0.2			0.6		
predator plaque T2-H2	3		71.8	27.0	0.8			0.4		

argali plaque	1	8th-7th	94.4	5.5		0.1			Shilikty 2, Kazakhstan	Tairov & Beisenov2015, 335
fish plaque	1		93.2	5.1		0.9	0.3	0.5		
plaque in the form of ibex	1		95.1	4.0			0.3	0.6		
griffin plaque	1		93.7	5.8				0.5		
pectoral	1	5th-4th	90.1	8.2	1.2		0.5	0.1	Zhalaulin- sky treasure, Kazakhstan	Tairov & Beisenov2015, 334
gold deer	1		92.4	7.6						
belt cap	1		89.4	8.4	1.2		1.0			
belt part	1		88.2	9.6	1.6		0.6			
deer plaque 01	1		84.3	14.3			0.6			
deer plaque 02	1		83.5	13.4	0.8		1.6	0.2		
hemispherical plaque	1		86.6	5.6	1.6		5.4			
gold plaque embossed with panther 01	1		92.7	6.5		0.8				
gold plaque embossed with panther 02	1		92.5	6.3	0.6		0.1	0.5		
gold plaque embossed with panther 03	1		91.7	6.1	0.8	0.6	0.2	0.6		
gold plaque embossed with panther 04	1		92.8	6.4	0.8					
gold horse ornament	6	4th-3rd	62.74	33.1	3.85				Khankarin- sky Dol, Altai	Dashkovskiy & Uminov 2012,52
gold foil	3		70.27	25.83	3.43					
gold plaque	4		71.08	24.52	3.99					
gold plaque	4		71.33	25.03	3.32					
gold ornament	3		71.51	24.73	3.55					

leopard on the mountain plaque	1	4th-3rd	72.49	22.15	3.8				Issyk, Kazakhstan	Tairov & Beisenov 2015, 333
horse-shaped plaque	1		74.28	23.24	1.2					
leopard plaque	1		72.99	23.7	1.1					
gold plate	1		73.62	22.83	2.8					
snow leopard	1		71.0	28.69	0.3					
gold plate in the form of bird on a tree	1		73.81	24.56	0.3					
winged horse	1		70.43	24.60	2.3					
floral plate	1		78.45	18.8	0.4					
geometric plate	1		74.41	25.21	0.2					
argali	1		66.73	27.37	5.8					
bird's beak	1		66.87	30.54	0.5					
arrow head	1		68.81	29.09	0.8					
goat plaque	1		82.45	16.15	0.1					
tiger	1		77.58	21.18	0.3					
panther	1		87.88	12.05	0.1					
belt plaque in the form of moose head	1		70.48	23.02	5.1					
deer belt plaque	1		78.82	18.22	1.6					
dagger scabbard in the form of elk	1		69.57	30.15	0.4					
dagger scabbard in the form of horse			69.66	29.05	0.6					
composite plaque	1		80.01	18.16	0.2					
earring with pendant and turquoise	1		82.32	15.86	0.6					
plaque in the form of lion head	1		67.18	30.83	0.1					
finger ring decorated with human head	1		84.12	9.27	6.3					
finger ring with plain design	1		81.02	10.92	7.8					
moon-like plaque	1		67.31	31.38	0.1					
gold plaque	1		66.82	33.19	0.3					

rectangular plaque	1	4th-3rd	73.01	25.78	0.2				Issyk, Kazakhstan	Tairov & Beisenov 2015, 333
square plaque	1		77.07	22.35	0.1					
Diamond-shaped plaque	1		78.07	20.70	0.1					
rectangular plaque	1		72.33	25.82	0.2					
shamrock plaque	1		71.41	28.47	0.1					
plaque in the form of tiger head 01	1		66.74	26.73	3.7					
plaque in the form of tiger head 02	1		69.65	26.6	2.8					

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