

## Electronic Supplementary Information for “Comparative elemental analysis of copper and magnesium alloy samples using IR - laser ablation, spark and glow discharge methods”

**Table SI-1** Spectral lines (nm) used with LS-ICP-OES and spark-OES

Element	LS – ICP-OES	Spark-OES
Al	237.8	394.4 <sup>1</sup> ; 308.2 <sup>h</sup>
Ca	318.1	422.6
Ce	322.1	413.7
Cu	224.7	324.7
La	231.9	408.67
Mn	263.2	403.3
Ni	221.6 ; 232.1 ; 300.2 <sup>a</sup>	352.4
Si	212.4	251.6
Zn	307.5	481.0
Zr	313.8	343.8

<sup>a</sup> All of the three noted lines were useless for calibration, <sup>1</sup> low range of mass fraction: < 1 mg kg<sup>-1</sup>; <sup>h</sup> higher range of mass fraction > 1 mg kg<sup>-1</sup>

**Table SI-2** Ranges of analyte contents in the estimated samples and isotopes measured

copper <sup>a</sup> (mg kg <sup>-1</sup> )		Magnesium alloys (% mass)	
Ag ( <sup>107</sup> Ag)	1.8-47.4	Al	0.001-10.38
As ( <sup>75</sup> As)	0.78-24.2	Ca	0.009-0.154
Bi ( <sup>209</sup> Bi)	0.53-9.6	Ce	1.64-2.64
Cd ( <sup>111/114</sup> Cd) <sup>b</sup>	0.9-7.8	Cu	0.004-0.131
Co ( <sup>59</sup> Co)	0.73-5.2	Mn	0.012-1.69
Cr ( <sup>53/52</sup> Cr) <sup>c</sup>	0.2-9.81	Ni	0.0005-0.015
Mg ( <sup>24</sup> Mg)	1.4-29.1	La	0.52-0.77
Mn ( <sup>55</sup> Mn)	0.22-10.1	Si	0.001-0.37
Ni ( <sup>60</sup> Ni)	0.7-25	Zn	0.001-2.87
Pb ( <sup>208</sup> Pb)	0.59-23.4	Zr	0.14-0.65
Sb ( <sup>121</sup> Sb)	0.58-31.2		
Te ( <sup>128/130</sup> Te) <sup>d</sup>	0.21-38.3		

<sup>a</sup> These are the ranges defined by all samples. Ranges measured may differ, due to the fact that not all samples are measured by the two methods; <sup>b,c,d</sup> alternative isotopes measured by GD-MS

**Table SI-3** Maximum relative standard deviations<sup>a</sup>. RSDs (%) and coefficients of determination  $R^2$  from measurements of analytes in copper powder samples with LS-ICP-MS and GD-MS

	<sup>107</sup> Ag	<sup>27</sup> Al	<sup>75</sup> As	<sup>209</sup> Bi	<sup>111</sup> Cd <sup>b</sup>	<sup>59</sup> Co	<sup>53</sup> Cr	<sup>165</sup> Ho	<sup>24</sup> Mg	<sup>55</sup> Mn	<sup>60</sup> Ni	<sup>208</sup> Pb	<sup>45</sup> Sc	<sup>128</sup> Te <sup>c</sup>	<sup>169</sup> Tm
RSD LS-ICP-MS	9.7	12.6	5.4	6.1	7.4	5.9	7.8	17.5	- <sup>d</sup>	9.4	9.6	7.4	13.5	4.9	15
GD-MS	7.4	6.4	8.2	7	19.2	5.7	9.6	11	5.8	8.1	8.8	7.6	14	18	15
$R^2$ LS-ICP-MS	0.998	0.94	0.999	0.999	0.999	0.998	0.998	0.997	- <sup>d</sup>	0.999	0.999	0.996	0.999	0.999	0.991
GD-MS	0.999	0.997	0.999	0.997	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.987	0.999	0.979	0.999

<sup>a</sup> for details see text; <sup>b</sup> <sup>114</sup>Cd for GD-MS measurements; <sup>c</sup> measurement in medium resolution for GD-MS; <sup>d</sup> data unsuitable for calibration

**Table SI-4** Maximum relative standard deviations<sup>a</sup>. RSDs (%) and coefficients of determination  $R^2$  from measurements of analytes in copper samples with LS-ICP-MS and GD-MS

	<sup>107</sup> Ag	<sup>75</sup> As	<sup>209</sup> Bi	<sup>111</sup> Cd <sup>b</sup>	<sup>59</sup> Co	<sup>53</sup> Cr <sup>c</sup>	<sup>24</sup> Mg	<sup>55</sup> Mn	<sup>60</sup> Ni	<sup>208</sup> Pb	<sup>121</sup> Sb	<sup>128</sup> Te <sup>d</sup>
RSD LS-ICP-MS	9.2	1.8	1.9	1.4	1.1	6.7	- <sup>e</sup>	3.5	3.7	3.9	3.1	4.8
GD-MS <sup>a</sup>	7.2	5.3	8.7	7.3	8.4	14.4	8.8	9.9	16.2	17.3	7.3	5.9
$R^2$ LS-ICP-MS	0.895	0.998	0.993	0.999	0.992	0.999	- <sup>e</sup>	0.999	0.978	0.988	0.997	0.997
GD-MS <sup>a</sup>	0.999	0.998	0.999	0.998	0.998	0.997	0.999	0.998	0.999	0.999	0.999	0.999

<sup>a</sup> for details see text; <sup>b</sup> measurements in medium resolution; <sup>c</sup> <sup>52</sup>Cr in case of GD-MS; <sup>d</sup> <sup>130</sup>Te in case of GD-MS; <sup>e</sup> data unsuitable for calibration.

**Table SI-5** Maximum relative standard deviations<sup>a</sup>, RSDs (%) and coefficients of determination  $R^2$  from measurements of analytes in magnesium alloy samples with LS-ICP-OES and spark -OES

		Al	Ca	Ce	Cu	La	Mn	Ni	Si	Zn	Zr
RSD	LS-ICP-OES	3.1	5.5	2.1	28	1.9	3.9	- <sup>b</sup>	5.2	4.8	1.5
	Spark-OES	10.2	5.3	1.4	5.7	1.1	1.8	20	8.7	4.6	11.3
$R^2$	LS-ICP-OES	0.996	0.98	0.997	0.996	0.996	0.999	- <sup>b</sup>	0.991	0.995	0.999
	Spark-OES	0.999	0.999	0.989	0.993	0.999	0.999	0.873	0.999	0.999	0.997

<sup>a</sup> for details see text; <sup>b</sup> data unsuitable for calibration

**Table SI-6** Results from F-tests of PVC<sup>a</sup> values from LS-ICP-MS and GD-MS measurements of pressed doped copper powder and copper samples

Pressed doped copper powder samples						Compact copper samples					
Isotope	PVC <sup>a</sup> (LS)	PVC (GD-MS)	Test value	Threshold (F-test)	TV <sup>c</sup> below threshold?	Isotope	PVC <sup>a</sup> (LS)	PVC (GD-MS <sup>d</sup> )	Test value	Threshold (F-test)	TV <sup>c</sup> below threshold?
<sup>107</sup> Ag	10.93	4.53	5.26	10.97	Yes	<sup>107</sup> Ag	11.35	2.39	22.51	29.46	Yes
<sup>27</sup> Al	65.12	13.17	24.43	10.97	No	<sup>75</sup> As	12.75	6.14	4.31	15.98	Yes
<sup>75</sup> As	5.11	3.26	2.45	8.47	Yes	<sup>209</sup> Bi	7.31	3.54	4.27	15.98	Yes
<sup>209</sup> Bi	1.58	2.61	2.73	8.47	Yes	<sup>111</sup> Cd	4.09	3.21	1.62	15.98	Yes
<sup>111</sup> Cd <sup>b</sup>	2.99	4.97	0.36	8.47	Yes	<sup>59</sup> Co	6.21	3.75	2.74	29.46	Yes
<sup>59</sup> Co	1.67	2.06	0.66	8.47	Yes	<sup>53</sup> Cr <sup>b</sup>	5.88	6.12	1.08	15.98	Yes
<sup>53</sup> Cr <sup>c</sup>	6.9	4.37	2.49	8.47	Yes	<sup>55</sup> Mn	19.3	5.27	13.39	15.98	Yes
<sup>165</sup> Ho	1.37	0.92	2.2	10.97	Yes	<sup>60</sup> Ni	15.71	2.27	48.02	15.98	No
<sup>55</sup> Mn	3.32	4.68	1.99	8.47	Yes	<sup>208</sup> Pb	9.69	4.04	5.73	15.98	Yes
<sup>60</sup> Ni	9.78	3.38	8.38	8.47	Yes	<sup>121</sup> Sb	7.69	4.55	2.85	15.98	Yes
<sup>208</sup> Pb	8.12	5.42	2.24	8.47	Yes	<sup>128</sup> Te <sup>c</sup>	7.91	3.93	4.05	15.98	Yes
<sup>45</sup> Sc	0.65	8.57	173.2	8.47	No						
<sup>128</sup> Te <sup>d</sup>	4.49	37.6	70.1	8.47	No						
<sup>169</sup> Tm	2.44	0.99	6.16	10.97	Yes						

<sup>a</sup> process variation coefficients; <sup>b</sup> <sup>114</sup>Cd in case of GD-MS; <sup>c</sup> Test value (TV); <sup>d</sup> medium resolution in case of GD-MS

**Table SI-7** Results from F-tests of PVC<sup>a</sup> values from LS-ICP-MS and spark-OES measurements of magnesium alloy samples

Analyte	PVC <sup>a</sup> (LS)	PVC (spark)	Test value (TV)	Threshold (F-test)	TV <sup>b</sup> below threshold?
Al	8.61	3.3	6.82	6.03	No
Ca	9.35	3.23	8.35	10.97	Yes
Cu	7.99	7.22	1.22	8.47	Yes
Mn	2.31	3.85	3.85	4.85	Yes
Si	16.99	6.38	7.08	8.47	Yes
Zn	4.48	3.23	1.92	6.99	Yes

<sup>a</sup> process variation coefficients (PVC); <sup>b</sup> Test Value (TV)