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Supplementary Information

Contributions on the Use of Bismuth as Internal Standard for Lead Determinations Using ICP-Based Techniques

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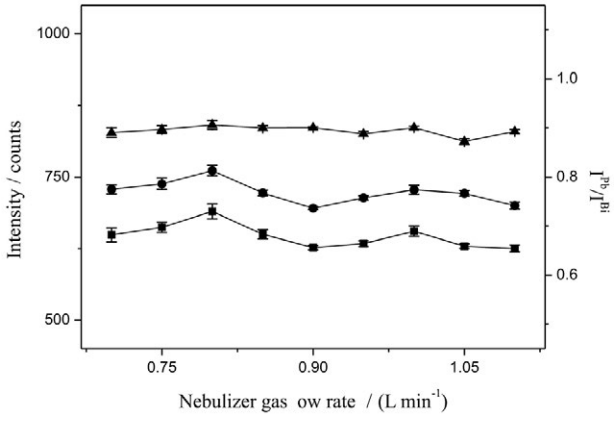

Figure S1. Influence of radio frequency power (RF) on Bi signal (●), Pb signal (■) and I^{Pb}/I^{Bi} ratio (▲) in ICP OES. Error bars represents the standard deviation (n = 3).

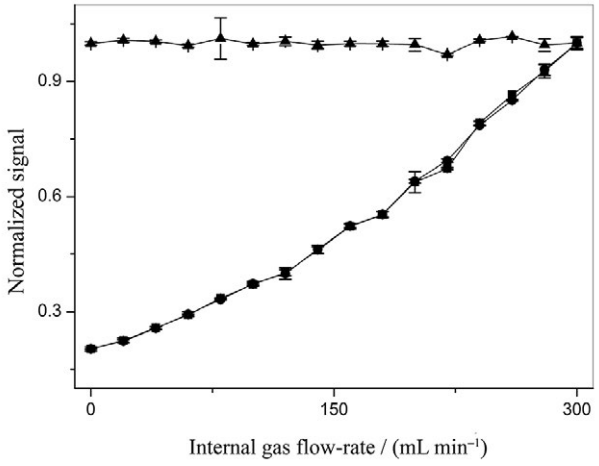

Figure S3. Influence of internal gas flow rate on Bi signal (●), Pb signal (■) and I^{Pb}/I^{Bi} ratio (▲) in ETV-ICP-MS. Error bars represents the standard deviation (n = 3).

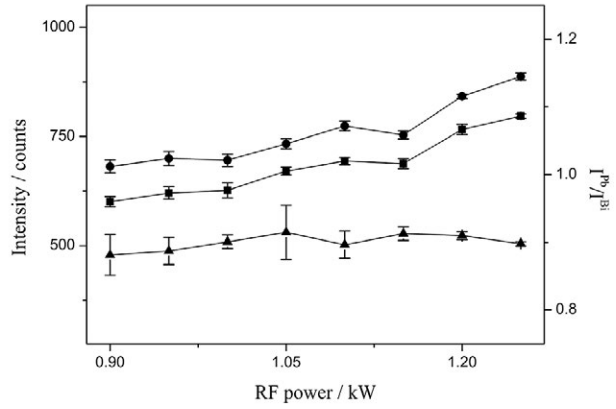

Figure S2. Influence of nebulizer gas flow rate on Bi signal (●), Pb signal (■) and I^{Pb}/I^{Bi} ratio (▲) in ICP OES. Error bars represents the standard deviation (n = 3).

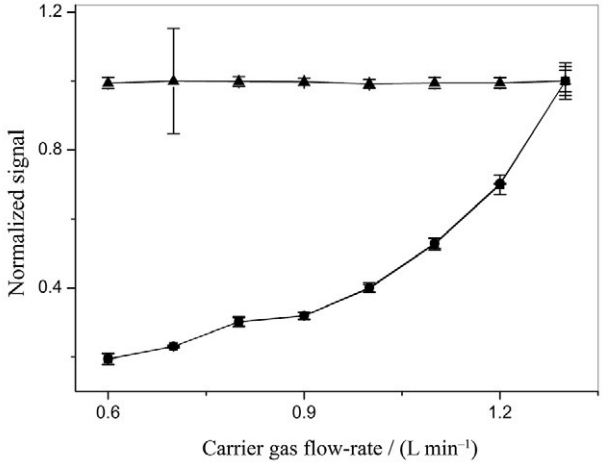

Figure S4. Influence of carrier gas flow rate on Bi signal (●), Pb signal (■) and I^{Pb}/I^{Bi} ratio (▲) in ETV-ICP-MS. Error bars represents the standard deviation (n = 3).

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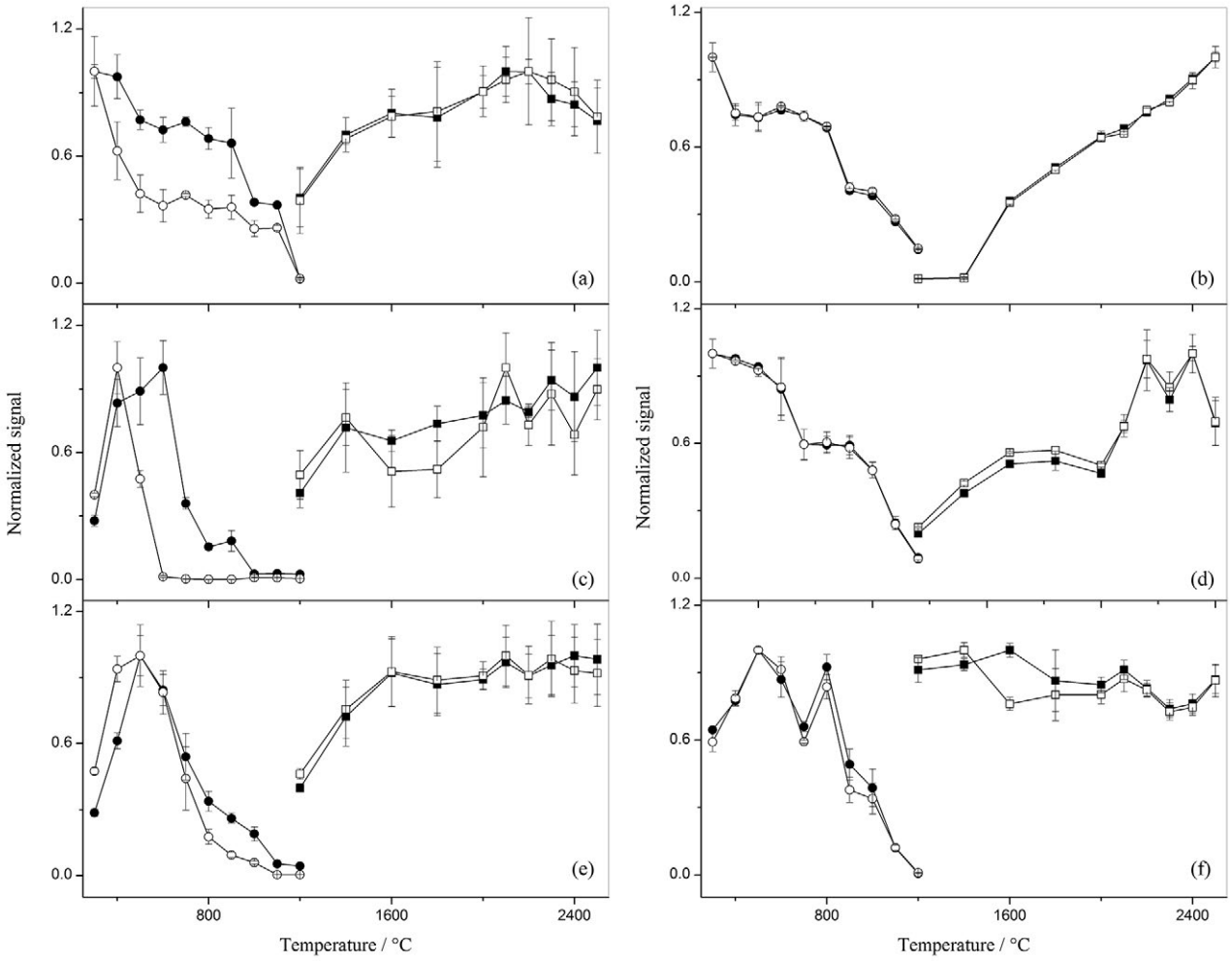

Figure S5. Pyrolysis (●: Pb; ●: Bi) and vaporization (■: Pb; □: Bi) curves without chemical modifier in aqueous solution (a); sugar cane spirit (c) and lemon juice (e) and with modifier in (b); (d) and (f), respectively. Data in curves correspond to 10 μg L^{-1} Pb + 10 μg L^{-1} Bi. Error bars represents the standard deviation (n = 3).

Table S1. Recoveries (mean ± SD, %) of spiked lead (100 μg L^{-1}) in samples by ICP OES

Sample	Without IS	With IS	Sample	Without IS	With IS
Beer	76.3 ± 2.0	110.3 ± 0.2	Liquid fertilizer	56.2 ± 1.0	97.8 ± 1.2
Colored sugar 1	83.9 ± 1.1	100.2 ± 0.9	*Maytenus ilicifolia*	68.6 ± 2.0	95.5 ± 1.5
Colored sugar 2	80.6 ± 1.5	103.0 ± 0.6	Milk	72.7 ± 6.2	98.4 ± 1.0
Colored sugar 3	83.4 ± 4.6	100.8 ± 0.8	Mineral water	86.9 ± 0.8	99.5 ± 0.3
Energy drink	82.3 ± 2.3	108.6 ± 0.3	Mouthwash	79.9 ± 0.9	102.0 ± 1.4
Ethanol fuel 1	70.8 ± 1.8	96.8 ± 1.4	Orange juice	91.1 ± 4.0	102.6 ± 0.9
Ethanol fuel 2	56.2 ± 3.4	101.9 ± 2.9	Peanut	66.5 ± 1.5	102.7 ± 0.4
Ethanol fuel 3	75.8 ± 4.2	99.9 ± 2.1	*Peumus boldus*	74.1 ± 2.0	100.6 ± 1.3
Ethanol fuel 4	70.0 ± 2.5	97.8 ± 2.5	PET	79.5 ± 3.6	109.5 ± 2.1
Grape juice	83.7 ± 2.4	108.9 ± 1.7	Shampoo	63.6 ± 2.5	95.6 ± 1.8
Hard candy 1	78.7 ± 4.9	104.2 ± 1.0	Soft drink 1	77.9 ± 6.5	105.9 ± 1.9
Hard candy 2	75.0 ± 7.0	99.4 ± 5.8	Soft drink 2	83.5 ± 5.1	106.9 ± 2.2
Hard candy 3	72.0 ± 9.0	98.5 ± 1.1	Solid fertilizer	66.6 ± 1.7	101.1 ± 0.7
Household clean. 1	75.4 ± 0.8	99.4 ± 0.4	Sugar cane spirit	70.9 ± 1.3	100.7 ± 0.8
Household clean. 2	71.7 ± 3.2	98.9 ± 0.8	Tea drink	73.1 ± 1.4	107.3 ± 1.5
Household clean. 3	66.7 ± 2.8	97.4 ± 2.4	Vinegar	70.1 ± 2.1	95.6 ± 1.8
Lemon juice	71.3 ± 2.3	97.1 ± 1.4	Vodka	72.9 ± 1.9	101.0 ± 1.8

IS: internal standard.

Table S2. Results (mean ± SD, μg L^{-1}) for Pb determination by ICP-MS and ETV-ICP-MS (n = 3)

Sample	ICP-MS		ETV-ICP-MS		Sample	ICP-MS		ETV-ICP-MS	
	Without IS	IS	Without IS	IS		Without IS	IS	Without IS	IS
Beer	1.69 ± 0.08	1.21 ± 0.03	1.78 ± 0.07	1.20 ± 0.04	Liquid fertilizer	0.10 ± 0.03	0.35 ± 0.01	< LOQ	< LOQ
Colored sugar 1	2.16 ± 0.37	2.62 ± 0.18	2.52 ± 0.15	2.44 ± 0.05	*Maytenus ilicifolia*	5.07 ± 0.18	0.99 ± 0.01	4.70 ± 0.01	1.01 ± 0.01
Colored sugar 2	0.30 ± 0.02	0.39 ± 0.02	< LOQ	< LOQ	Milk	0.46 ± 0.02	0.34 ± 0.02	< LOQ	< LOQ
Colored sugar 3	0.62 ± 0.09	0.74 ± 0.02	0.57 ± 0.01	0.70 ± 0.01	Mineral water	0.15 ± 0.01	0.23 ± 0.01	< LOQ	< LOQ
Energy drink	3.29 ± 0.18	5.19 ± 0.04	2.45 ± 0.12	4.90 ± 0.04	Mouthwash	0.43 ± 0.02	1.04 ± 0.08	0.47 ± 0.01	1.18 ± 0.01
Ethanol fuel 1	0.20 ± 0.02	0.16 ± 0.01	< LOQ	< LOQ	Orange juice	0.09 ± 0.01	0.08 ± 0.01	< LOQ	< LOQ
Ethanol fuel 2	0.21 ± 0.02	0.12 ± 0.01	< LOQ	< LOQ	Peanut	4.50 ± 0.16	2.29 ± 0.04	4.32 ± 0.11	2.15 ± 0.08
Ethanol fuel 3	0.32 ± 0.01	0.25 ± 0.02	< LOQ	< LOQ	*Peumus boldus*	2.36 ± 0.05	0.36 ± 0.01	2.33 ± 0.31	0.32 ± 0.02
Ethanol fuel 4	0.35 ± 0.01	0.22 ± 0.01	< LOQ	< LOQ	PET	0.34 ± 0.04	0.09 ± 0.01	< LOQ	< LOQ
Grape juice	0.91 ± 0.02	1.12 ± 0.01	1.05 ± 0.02	1.02 ± 0.01	Shampoo	0.84 ± 0.05	3.73 ± 0.13	0.88 ± 0.05	3.70 ± 0.03
Hard candy 1	1.60 ± 0.09	0.90 ± 0.02	1.81 ± 0.12	0.97 ± 0.05	Soft drink 1	0.15 ± 0.02	0.11 ± 0.01	< LOQ	< LOQ
Hard candy 2	2.01 ± 0.02	1.02 ± 0.01	2.14 ± 0.16	1.02 ± 0.01	Soft drink 2	3.95 ± 0.05	1.55 ± 0.03	3.86 ± 0.47	1.51 ± 0.13
Hard candy 3	0.30 ± 0.06	0.20 ± 0.03	< LOQ	< LOQ	Solid fertilizer	0.13 ± 0.02	0.19 ± 0.01	< LOQ	< LOQ
Household clean. 1	0.88 ± 0.07	1.57 ± 0.07	0.70 ± 0.10	1.68 ± 0.05	Sugar cane spirit	0.97 ± 0.11	0.73 ± 0.05	0.98 ± 0.10	0.73 ± 0.06
Household clean. 2	3.62 ± 0.12	4.38 ± 0.01	3.50 ± 0.05	4.00 ± 0.03	Tea drink	1.01 ± 0.01	1.04 ± 0.01	1.31 ± 0.12	1.03 ± 0.08
Household clean. 3	0.26 ± 0.04	0.43 ± 0.02	< LOQ	< LOQ	Vinegar	3.76 ± 0.06	2.16 ± 0.09	3.74 ± 0.15	2.23 ± 0.08
Lemon juice	1.34 ± 0.02	3.61 ± 0.05	1.31 ± 0.10	3.78 ± 0.06	Vodka	0.82 ± 0.16	1.37 ± 0.11	0.79 ± 0.04	1.57 ± 0.02

IS: internal standar; LOQ: limit of quantification.

Table S3. Recoveries (mean ± SD, %) of spiked lead (1.0 μg L^{-1}) in samples by ICP-MS

Sample	Without IS	With IS	Sample	Without IS	With IS
Beer	89.1 ± 7.1	99.5 ± 0.7	Liquid fertilizer	36.1 ± 5.9	101.6 ± 4.0
Colored sugar 1	90.2 ± 1.8	104.4 ± 0.3	*Maytenus ilicifolia*	90.5 ± 4.3	99.9 ± 1.5
Colored sugar 2	95.2 ± 8.7	100.3 ± 2.1	Milk	52.2 ± 5.9	96.6 ± 0.8
Colored sugar 3	101.5 ± 8.6	100.9 ± 6.6	Mineral water	53.8 ± 1.2	97.5 ± 0.5
Energy drink	66.1 ± 3.0	97.6 ± 3.0	Mouthwash	79.9 ± 5.2	100.2 ± 2.1
Ethanol fuel 1	63.3 ± 7.0	99.1 ± 4.6	Orange juice	78.8 ± 7.3	94.9 ± 1.0
Ethanol fuel 2	55.3 ± 9.4	101.7 ± 4.1	Peanut	111.5 ± 2.2	95.1 ± 2.2
Ethanol fuel 3	58.4 ± 3.2	98.2 ± 2.9	*Peumus boldus*	118.1 ± 2.4	104.4 ± 1.3
Ethanol fuel 4	52.9 ± 1.3	99.3 ± 2.8	PET	99.2 ± 5.3	103.6 ± 4.8
Grape juice	69.2 ± 8.2	104.4 ± 5.8	Shampoo	106.1 ± 10.2	99.3 ± 0.2
Hard candy 1	99.8 ± 4.7	106.4 ± 4.5	Solid fertilizer	79.2 ± 4.5	98.4 ± 3.2
Hard candy 2	92.5 ± 4.0	95.9 ± 0.4	Soft drink 1	78.3 ± 2.7	94.9 ± 2.1
Hard candy 3	114.9 ± 10.7	97.5 ± 0.5	Soft drink 2	99.6 ± 0.5	102.8 ± 0.8
Household clean. 1	125.8 ± 9.7	99.6 ± 2.2	Sugar-cane spirit	136.0 ± 10.2	94.6 ± 1.3
Household clean. 2	104.6 ± 7.3	98.0 ± 0.1	Tea drink	59.5 ± 3.4	106.3 ± 2.9
Household clean. 3	79.7 ± 11.3	101.4 ± 2.5	Vinegar	67.8 ± 4.9	98.4 ± 2.4
Lemon juice	79.2 ± 4.8	101.8 ± 1.0	Vodka	82.5 ± 9.3	97.6 ± 2.5

IS: internal standard.

Table S4. Recoveries (mean ± SD, %) of spiked lead (10 μg L^{-1}) in samples by ETV-ICP-MS

Sample	Without IS	With IS	Sample	Without IS	With IS
Beer	15.1 ± 0.4	92.4 ± 0.1	Liquid fertilizer	5.3 ± 0.6	100.7 ± 3.2
Colored sugar 1	62.1 ± 3.5	96.8 ± 1.9	*Maytenus ilicifolia*	123.1 ± 0.7	100.9 ± 0.3
Colored sugar 2	98.1 ± 4.0	100.7 ± 0.6	Milk	104.9 ± 0.5	96.6 ± 0.5
Colored sugar 3	80.1 ± 3.7	98.8 ± 1.3	Mineral water	82.5 ± 1.5	96.1 ± 1.2
Energy drink	64.5 ± 2.8	97.3 ± 0.8	Mouthwash	45.3 ± 3.8	97.1 ± 2.5
Ethanol fuel 1	61.5 ± 3.5	95.0 ± 2.6	Orange juice	90.4 ± 0.5	97.7 ± 0.3
Ethanol fuel 2	58.3 ± 3.8	100.5 ± 2.6	Peanut	89.6 ± 1.2	94.7 ± 1.2
Ethanol fuel 3	62.8 ± 1.6	95.8 ± 0.5	*Peumus boldus*	114.4 ± 2.3	96.8 ± 1.5
Ethanol fuel 4	64.8 ± 0.7	95.5 ± 0.4	PET	101.5 ± 5.1	101.1 ± 0.3
Grape juice	54.0 ± 1.2	94.7 ± 0.8	Shampoo	12.9 ± 0.6	97.2 ± 1.2
Hard candy 1	81.8 ± 1.4	99.7 ± 1.2	Soft drink 1	73.6 ± 5.0	104.6 ± 1.9
Hard candy 2	90.5 ± 2.5	104.5 ± 0.8	Soft drink 2	89.8 ± 1.7	118.9 ± 0.7
Hard candy 3	118.8 ± 4.6	96.3 ± 0.4	Solid fertilizer	40.5 ± 2.0	96.0 ± 1.5
Household clean. 1	53.2 ± 1.9	93.8 ± 0.4	Sugar cane spirit	68.9 ± 2.5	94.1 ± 2.3
Household clean. 2	16.0 ± 3.3	113.3 ± 0.8	Tea drink	38.1 ± 4.5	98.6 ± 4.2
Household clean. 3	41.3 ± 1.6	95.8 ± 0.6	Vinegar	88.2 ± 4.1	108.2 ± 3.6
Lemon juice	70.1 ± 7.1	103.5 ± 1.0	Vodka	94.6 ± 2.6	94.8 ± 0.3

IS: internal standard.