Results of Proficiency Test
Metals in Plastics
September 2009

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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CONTENTS

1 INTRODUCTION

World-wide, many consumer products with plastic parts are produced and transported. These plastic parts are produced under strict regulations. For instant in the European Directive 2002/95/EC maximum concentrations are specified for metals in plastic: the sum of Lead (Pb), mercury (Hg), Cadmium (Cd) and hexavalent Chromium (VI) may not exceed 0.1 %M/M, while the maximum concentration for Cadmium may not exceed 100 mg/kg.
Products are tested for metals contents in the countries of origin as well in EU-countries. Sometimes significantly, different results are found, thus causing problems with the import of the products.

The determination of metals in plastics is known to give problems with regard to the comparability of laboratory results. However, still only few plastic reference materials are available (ref 16.). As an alternative, participation in a proficiency test may enable the laboratories to check their performance and thus to increase this comparability. Therefore, a proficiency testing scheme (laboratory-evaluating interlaboratory study) for the determination of metals in plastics is organised by the Institute for Interlaboratory Studies since 1998. Starting with only total Cadmium, over the years the scope was extended with total Lead, total Chromium and Chromium (VI) and in this year for the first time with total Mercury.
In the international interlaboratory study of September 2009 106 laboratories from 29 different countries participated (See appendix 3). In this report, the results of the proficiency test are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, The Netherlands, was the organiser of this proficiency test. It was decided to send 2 different samples (approximately 5 gram each), labelled #0950 and #0951. Participants were also requested to report some details of the methods used.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on ISO guide 43 and ILAC-G13:2007. This ensures 100% confidentially of participant's data. Also customer's satisfaction is measured on a regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organisation was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of November 2008 (iis-protocol, version 3.1). This protocol can be downloaded from the iis website http://www.iisnl.com.

2.3 CONFIDENTIALITY STATEMENT

All data present in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

Two different samples positive on metals were selected. The first material (#0950) was a yellow coloured polypropylene sample. The second material (#0951) was a pink coloured polyethylene sample. Both batches were divided over plastic bags, about 5 grams for each sample.
The homogeneity of the subsamples #0950 was checked by determination of Lead content on 5 stratified random selected subsamples. The homogeneity of the subsamples #0951 was also checked by determination of Lead content on 5 stratified random selected subsamples.

	Lead as Pb in #0950	Lead as Pb in #0951
Sample 1	290 mg/kg	314 mg/kg
Sample 2	302 mg/kg	324 mg/kg
Sample 3	291 mg/kg	322 mg/kg
Sample 4	307 mg/kg	320 mg/kg
Sample 5	291 mg/kg	320 mg/kg

Table 1: results of the homogeneity test on the subsamples #0950 and #0951

From the above results of the homogeneity test, the relative between sample standard deviations RSD_r were calculated and compared with 0.3 times the relative proficiency target standard deviations RSD_R in agreement with the procedure of ISO 13528, Annex B2 in the next table:

	Lead as Pb in #0950	Lead as Pb in #0951
RSD_r (observed)	2.6%	1.2%
reference method	Horwitz	Horwitz
0.3 x RSD_R (reference method)	5.7%	5.6%

Table 2: relative repeatability standard deviations of Lead contents of the subsamples #0950 and #0951

The calculated variation coefficients RSDr are both in good agreement with the estimated targets, calculated using the Horwitz equation. Therefore, homogeneity of all subsamples was assumed.

To each of the participating laboratories one set of samples, (1* sample #0950 and 1* sample #0951) was sent on August 19, 2009.

2.5 ANALYSIS

The participants were requested to determine on both samples: total Cadmium, total Lead, total Chromium, total Mercury and hexavalent Chromium (VI). It was explicitly requested to treat the samples as if it were routine samples and to report the analytical results using the indicated units on the report form and not to round the results, but report as much significant figures as possible. It was also requested not to report 'less than' results, which are above the detection limit, because such results can not be used for meaningful statistical calculations.
To get comparable results a detailed report form, on which the units were prescribed, was sent together with each set of samples. In addition, a letter of instructions was added to the package.
The laboratories were also requested to complete the report form with some details of the methods used.

3 RESULTS

During four weeks after sample despatch, the results of the individual laboratories were received. The original data are tabulated per sample in the appendix 1 of this report. The laboratories are represented by their code numbers.

Directly after deadline, a reminder fax was sent to those laboratories that did not report results at that moment.
Shortly after the deadline, the available results were screened for suspect data. A result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the results. Additional or corrected results are used for the data analysis and the original results are placed under 'Remarks' in the result tables in appendix 1.

3.1 STATISTICS

Statistical calculations were performed as described in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of November 2008 (iis-protocol, version 3.1).

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test. After removal of outliers this check was repeated. All data sets proved to have a normal distribution.

In accordance to ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test, by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

Finally, the reproducibilities were calculated from the standard deviations by multiplying them with a factor of 2.8.

3.2 GRAPHICS

In order to visualise the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported analysis results are plotted. The corresponding laboratory numbers are under the X-axis.
The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected standard. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle. Furthermore, Kernel Density Graphs were made. This method is producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 4; nr.14 and 15).

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the spread of this interlaboratory study.

The target standard deviation was calculated from the target reproducibility (preferable from a standard method) by division with 2.8. The z-scores were calculated in accordance with:

$$z_{(target)} = (\text{result} - \text{average of PT}) / \text{target standard deviation}$$

The literature requirements were taken from EN 1122:2001, “Determination of Cadmium in plastics with the method of the wet decomposition” for Cadmium and from ASTM D4004:1998 for Lead. For total Chromium and Chromium (VI) and total Mercury no literature requirements were available

The $z_{(target)}$ scores are listed in the result tables in appendix 1.

Absolute values for z<2 are very common and absolute values for z>3 are very rare. Therefore, the usual interpretation of z-scores is as follows:

	$\lvert z \rvert < 1$	good
$1 <$	$\lvert z \rvert < 2$	satisfactory
$2 <$	$\lvert z \rvert < 3$	questionable
	$\lvert z \rvert > 3$	unsatisfactory

4 EVALUATION

In this interlaboratory study, no problems were encountered with the despatch of the samples.
Eight participants reported the results after the final reporting date and four participants did not report any results at all. Not all laboratories were able to report all analytes requested.
Finally, 102 of the 106 participants submitted analysis results. The 102 reporting laboratories sent in 712 numerical results. Observed were 27 outlying results, which is 3.7 %. In proficiency studies, outlier percentages of 3 % - 7.5 % are quite normal.

4.1 PERFORMANCE EVALUATION OF THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant standard and the reproducibility as found for the group of participating laboratories. The average results per sample, calculated reproducibilities and reproducibilities derived form the literature standards are compared in the next tables.

Parameter	unit	n	Average	2.8 * sd	R (target)
Total Cadmium as Cd	mg/kg	95	37.26	10.38	9.32
Total Chromium as Cr	mg/kg	89	67.50	18.29	16.04
Total Lead as Pb	mg/kg	95	268.2	74.1	70.5
Total Mercury as Hg	mg/kg	53	2.67	2.78	1.03
Hexavalent Chromium (VI)	mg/kg		See page 22-23		

Table 3: performance overview for PP sample #0950

Parameter	unit	N	Average	2.8 * sd	R (lit)
Total Cadmium as Cd	mg/kg	94	(3.96)	(1.38)	(0.99)
Total Chromium as Cr	mg/kg	89	36.72	12.03	9.56
Total Lead as Pb	mg/kg	94	271.7	55.6	71.5
Total Mercury as Hg	mg/kg	50	2.26	2.92	0.89
Hexavalent Chromium (VI)	mg/kg	56	See page 24-25		

Table 4: performance overview for PE sample #0951

Without further statistical calculations, it can be concluded that there is a fair compliance of the group of participating laboratories with the relevant standards for total Cadmium, total Lead and total Chromium.

The analytes that were problematic are discussed in paragraph 4.2.

4.2 EVALUATION PER ELEMENT

In this section, the results are discussed per analyte.

Total Cadmium: No analytical problems were observed.
For sample #0950, the calculated reproducibility is, after rejection of four statistical outliers, almost in agreement with the requirements of EN1122:01. When the EN1122 data is evaluated separately, the calculated reproducibility of the EN1122 results is somewhat smaller than for the whole group and in full agreement with the requirements of the standard.
For sample #0951, the group agreed on an average result of less than 5 mg/kg, which may be below or near the detection limit of the test method EN1122:01.

Total Chromium: This determination is somewhat problematic.
For sample #0950, the calculated reproducibility is, after rejection of five statistical outliers, almost in agreement with the estimated reproducibility limits calculated using the Horwitz equation.
For sample #0951, the calculated reproducibility is, after rejection of four statistical outliers, not in agreement with the estimated reproducibility limits calculated using the Horwitz equation.

Chromium VI: This determination is very problematic.
For sample #0950, the component that was used to spike Chromium VI to the plastic sample was pure insoluble Lead chromate (PbCrO4). Therefore, the total Chromium content should in principle be equal to the hexavalent Chromium content (See also paragraphs 4.3 and 5). The majority of the reporting laboratories did detect Chromium VI in sample #0950, but agreed on a result of approx 8.5 mg/kg. Only two participants reported a result of approx 67.5 mg/kg, which was expected from the consensus value of total chromium content of sample #0950.
For sample #0951, the component that was used to spike Chromium VI to the plastic sample was pure readily soluble Potassium chromate (K2CrO4). Therefore, the total Chromium content should in principle be equal to the hexavalent Chromium content (See also paragraphs 4.3 and 5). The majority of the reporting laboratories did detect Chromium VI in sample #0951, but agreed on a result of approx 10.3 mg/kg. Only three participants reported a result of approx 33.9 mg/kg, which was expected from the consensus value of total chromium content of sample #0951.

Total Lead: This determination is problematic for at least four laboratories.
For sample #0950, the calculated reproducibility is, after rejection of three statistical outliers, almost in agreement with the requirements of ASTM D4004:02, but not at all with the estimated reproducibility calculated using the Horwitz equation.

For sample #0951, the calculated reproducibility is, after rejection of the four statistical outliers, in good agreement with the requirements of ASTM D4004:02 and almost with the estimated reproducibility calculated using the Horwitz equation.

Total Mercury: This determination is problematic at the evaluated concentration level of 2-3 mg/kg.
For sample #0950, the calculated reproducibility is, after rejection of three statistical outliers, not at all in agreement with the estimated reproducibility calculated using the Horwitz equation.
For sample #0951, the calculated reproducibility is, after rejection of three statistical outliers, not at all in agreement with the estimated reproducibility calculated using the Horwitz equation.

4.3 EVALUATION OF THE METHODS USED

The reported details of the methods that were used by the participants are listed in appendix 2.

For the determination of total Cadmium in plastics, the EN1122 method is considered to be the official EC test method. In this proficiency test only 36 participants (36% of all) used a version of EN1122. Most other participants used in-house, IEC62321 or EPA test methods based on acid digestion (wet ashing or microwave destruction) and four participants used XRF as method.
No correlation between the method used and the quality of the results could be found.
Only four laboratories did use XRF for the determination of metals and thus unfortunately no significant conclusions could be drawn about the quality of the results of this technique.
It can be concluded that the determination of Cadmium in the investigated polypropylene and polyethylene material was not problematic.

For the determination of total Chromium in plastics, test method IEC62321 is available, regretfully without precision data.
In this interlaboratory study, the majority of the group used the IEC62321 or EPA 3050, 3051 or 3052 methods. Two participants reported to have used EN 1122, which is only applicable for Cadmium. Five participants used XRF and the other participants used in-house methods based on acid digestion (dry ashing, microwave destruction or combustion).
No correlation between method used and quality of the results could be found.
It can be concluded that the determination of total Chromium in the investigated polypropylene and polyethylene material at a level of resp. 67.5 and 36.7 mg/kg is not problematic.

For determination of hexavalent Chromium in polymers, a method is available: IEC62321:09. The method is based on EPA 3060A and EPA7196. Regretfully this method does not yet mention precision requirements. In this interlaboratory study, thirty-six laboratories used this method and almost all other participants reported to have used EPA 3060A or an in house method. The test method for Chromium VI does contain several parts that may influence the test results strongly, like: the particle size, the digestion temperature or the alkaline digestion solution.

Therefore, some important details (particle size, extraction technique and extraction conditions) were requested to be reported (see appendix 2). One can see that a very large variation of details was reported by the participants.

For the determination of total Lead in plastics, test method IEC62321 is available, regretfully without precision data.
In this interlaboratory study, the majority of the group used the IEC62321 or EPA 3052, 3051 or 3050-B methods. Five participants used XRF and the other participants used in-house methods based on acid digestion (wet ashing, microwave destruction or combustion).
No correlation between method used and quality of the results could be found.
It can be concluded that the determination of total Lead in the investigated polypropylene and polyethylene material at a level of 270 mg/kg was problematic for polypropylene only.

For the determination of total Mercury in plastics, test method IEC62321 is available, regretfully without precision data.
In this interlaboratory study, the majority of the group used the IEC62321 or EPA 3052, 3051 or 3050-B methods, which are designed for environmental samples and the applicability for plastics is unknown.
Five participants used XRF and the other participants used in-house methods based on acid digestion (wet ashing, microwave destruction or combustion).
No correlation between method used and quality of the results could be found.
It can be concluded that the determination of total Mercury was problematic at a level of 2.8 mg/kg in polypropylene and 2.6 mg/kg in polyethylene.

Furthermore, it is remarkable to see that several laboratories that reported to have used IEC62321 did not reduce the samples to a particle size of less than 500 µm or reduced the sample even not at all.

4.4 COMPARISON WITH PAST PROFICIENCY TESTS

The number of participants increased from 66 in 2005 to 106 in this round. The percentage of outliers decreased over the years from 10.3% in 2005 to 3.7 % of the numerical results in 2009.
The relative reproducibilities per range for Cadmium, Lead, Chromium and Mercury as observed in this proficiency test are compared with the findings in previous rounds in table 6.

Range	25-100 mg Cd/kg	±250 mg Cd/kg	50-100 mg Pb/kg	±13000 mg Pb/kg	50-250 mg Cr/kg	0-5 mg Hg/kg
2002	51 %	35 %	81 %	47 %	--	--
2003	31 %	--	100 %	83 %	--	--
2004	33 %	25 %	--	41 %	--	--
2005	21 %	--	--	35 %	34 %	--
2006	20 %	--	26 %	--	30 %	--
2007	23 %	--	22-30 %	--	43 %	--
2008	25 %	--	24 %	--	25 %	--
2009	28 %	--	20-28 %	--	27-32%	104-129%
EN1122:01	25 %	25 %	--	--	--	--
ASTM D4004:98	--	--	38 %	26 %	--	--

Table 6: comparison of the relative Cd, Pb, Cr and Hg reproducibilities (in %) in the previous rounds and in the present round

5 CONCLUSIONS

The observed spread in the results for the total Cadmium determination in this proficiency test is in full agreement with the requirements of the standard EN1122:01. All laboratories proved to be able to test total Cadmium with sufficient reliability. This is in agreement with our earlier findings (ref 16).

The observed spread in the results for the total Chromium determination in this proficiency test is in full agreement with the requirements of the Horwitz equation compared with the previous proficiency tests. Some laboratories did have problems with the determination of total Chromium content. All other laboratories proved to be able to test total Chromium with sufficient reliability.

The observed spread in the results for the total Lead determination in this proficiency test is in full agreement with the requirements of ASTM D4004 and the Horwitz equation. Four laboratories did have problems with the determination of total Lead content. All the other laboratories proved to be able to test total Lead with sufficient reliability.

The observed spread in the results for the total Mercury determination in this proficiency test is problematic and not in agreement with the requirements of the Horwitz equation. This was expected as this is the first time Mercury was found positive in a sample. A large group of the reporting laboratories did have problems with the determination of total mercury content.

The determination of hexavalent Chromium in polypropylene and polyethylene is very problematic in this proficiency test. During the sample, preparation procedure hexavalent Chromium was added as pure $PbCrO_4$ (#0950) and K_2CrO_4 (#0951). Therefore, the hexavalent Chromium content was expected to be equal or close to the total Chromium content of 67.5 mg/kg and 36.7 mg/kg. Regretfully, no unambiguous consensus value could be determined. Only two (#0950) and three (#0951) laboratories were able to find results that are near the total Chromium values.
The method IEC62321 prescribes the sample pre-treatment, with one very essential test detail. The sample must be grounded into a fine powder and passing through a 500 µm sieve (chapter 10.5). From appendix 2 it is clear that many laboratories did not reduce the particle size sufficiently.

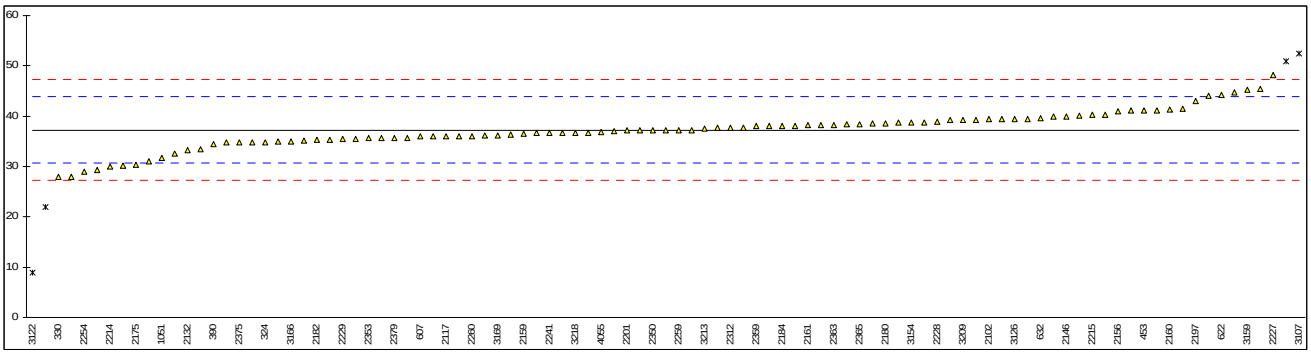
APPENDIX 1

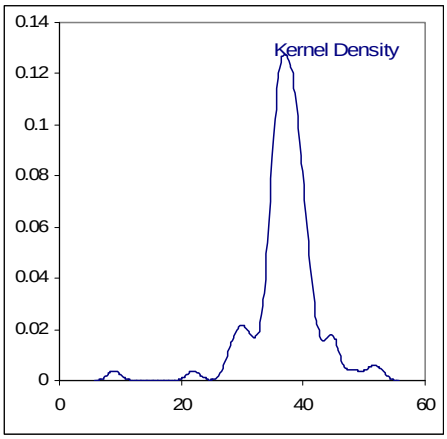
Determination of total Cadmium as Cd in PP on sample #0950; results in mg/kg

Lab	method	value	mark	z(targ)	Remarks
110		-----		-----	
310	In house	38.7		0.43	
324	IEC62321	34.831		-0.73	
330	In house	27.9		-2.81	
339	IEC62321	29.3		-2.39	
357	In house	36		-0.38	
390	EPA6020	34.5		-0.83	
453	IEC62321	41.2		1.18	
551	IEC62321	39.40		0.64	
607	EPA3051	36		-0.38	
622	EN1122	44.26		2.10	
632	EN1122	39.66		0.72	
840	IEC62321	35.60		-0.50	
1051	EN1122	31.65	C	-1.69	First reported 49.77
1126	XRF	35		-0.68	
1195	In house	30.15		-2.14	
1800	In house	39.9		0.79	
2102	In house	39.39		0.64	
2117	In house	36.0		-0.38	
2129	EN1122	41.1		1.15	
2131	In house	38.10		0.25	
2132	EN1122	33.18		-1.23	
2146	EN1122	40.0		0.82	
2156	IEC62321	41.0		1.12	
2159	In house	36.60		-0.20	
2160	In house	41.34		1.23	
2161	In house	38.2		0.28	
2165	EPA3052	37.8		0.16	
2169	IEC62321	34.807		-0.74	
2172	EN1122	37.13		-0.04	
2175	EPA3052	30.41		-2.06	
2179	IEC62321	40.36		0.93	
2180	In house	38.58		0.40	
2182	EN1122	35.26		-0.60	
2184	EN1122	38.0		0.22	
2190	EN1122	41.2		1.18	
2196	EN1122	28		-2.78	
2197	In house	42.95		1.71	
2199	EPA3052	32.51		-1.43	
2201	IEC62321	37.12		-0.04	
2202	IEC62321	44.8		2.27	
2212		-----		-----	
2214	XRF	30		-2.18	
2215	EN1122	40.31		0.92	
2216		-----		-----	
2227	In house	48.25		3.30	
2228	In house	39.0		0.52	
2229	In house	35.4		-0.56	
2231	EPA3052	35.43		-0.55	
2241	IEC62321	36.67		-0.18	
2246	In house	36.00		-0.38	
2251		-----		-----	
2253	EPA3051	36.72		-0.16	
2254	In house	29		-2.48	
2256	EN1122	39.48		0.67	
2257		-----		-----	
2259	IEC62321	37.21		-0.02	
2260	EN1122	36.0		-0.38	
2262		-----		-----	
2310	EN1122	38.4		0.34	
2312	EN1122	37.8		0.16	
2350	EN1122	37.18		-0.02	
2353	EN1122	35.6		-0.50	
2359	EPA3052	38.0		0.22	
2362	EN1122	44.0		2.03	
2363	IEC62321	38.3		0.31	
2365	IEC62321	38.4		0.34	
2366	EN1122	39.3		0.61	
2369	EN1122	36.6367		-0.19	
2370	IEC62321	35.7		-0.47	
2372	IEC62321	37.7		0.13	

2375	IEC62321	34.8		-0.74
2379	IEC62321	35.6		-0.50
2380		-----		-----
2385	EN1122	39.2		0.58
3104	EN1122	37.24		-0.01
3107	In house	52.5	G(0.05)	4.58
3110	EN1122	38.8		0.46
3116	EN1122	41.40		1.24
3122	XRF	9	G(0.01)	-8.49
3124	EPA3052	36.3		-0.29
3126	INAA	39.4		0.64
3151	In house	38.5		0.37
3153	IEC62321	37.2		-0.02
3154	EN1122	38.76		0.45
3159	EN1122	45.2		2.39
3160	In house	45.41		2.45
3163	XRF	51	G(0.05)	4.13
3166	In house	35.0		-0.68
3167	EN1122	35.38		-0.57
3169	EN1122	36.239		-0.31
3172	EN1122	35.2		-0.62
3182	EN1122	40.14		0.87
3185	IEC62321	38.25		0.30
3191	IEC62321	37.0		-0.08
3192	EN1122	36.09		-0.35
3199	In house	30.95		-1.90
3209	EPA3052	39.21		0.59
3210	EN1122	22	G(0.05)	-4.59
3213	IEC62321	37.55		0.09
3216	EPA3052	36.74		-0.16
3218	EN1122	36.73		-0.16
3235	EN1122	38		0.22
3246	EPA3051	33.46		-1.14
3248	EN1122	34.8		-0.74
4055	EPA3052	36.91		-0.11

			Only EN1122 data:
	Normality	not OK	OK
	n	95	35
	outliers	4	1
	mean (n)	37.26	37.92
	st.dev. (n)	3.707	3.428
	R(calc.)	10.38	9.60
	R(EN1122:01)	9.32	9.48



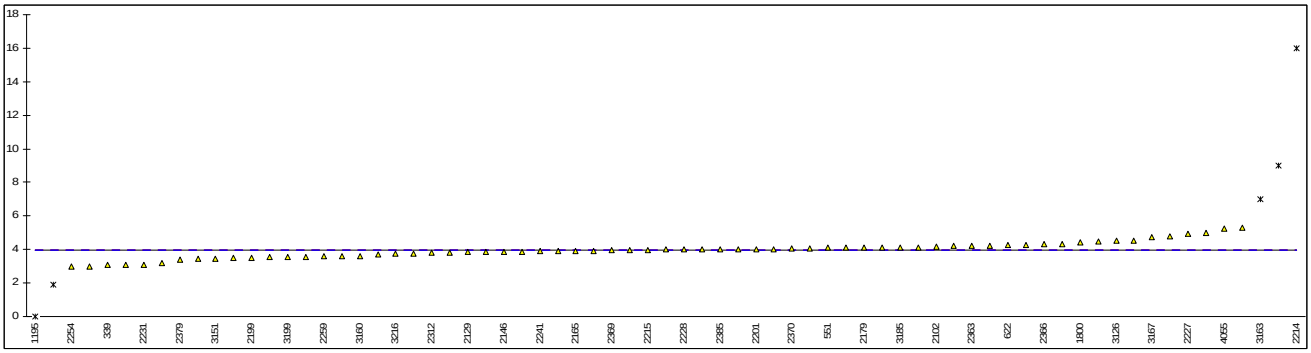


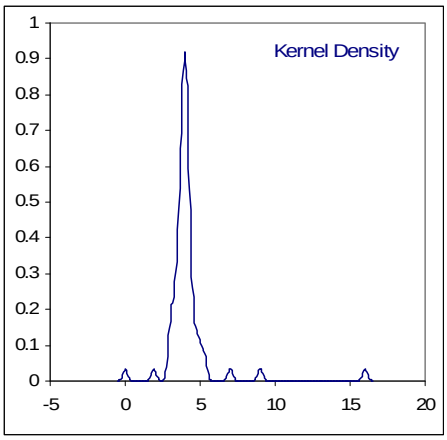
Determination of total Cadmium as Cd in PE on sample #0951; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310	In house	<10		-----	
324	IEC62321	4.14		-----	
330	In house	3.1		-----	
339	IEC62321	3.1		-----	
357	In house	<5		-----	
390	EPA6020	4.0		-----	
453	IEC62321	4.3		-----	
551	IEC62321	4.10		-----	
607	EPA3051	3.6		-----	
622	EN1122	4.25		-----	
632	EN1122	3.868		-----	
840	IEC62321	3.55		-----	
1051	EN1122	<5	C	-----	First reported 5.82
1126	XRF	<20		-----	
1195	In house	0	ex	-----	Result excluded, not a true value
1800	In house	4.4		-----	
2102	In house	4.18		-----	
2117	In house	3.50		-----	
2129	EN1122	3.85		-----	
2131	In house	4.54		-----	
2132	EN1122	<7.5		-----	
2146	EN1122	3.86		-----	
2156	IEC62321	5.3		-----	
2159	In house	n.d.		-----	
2160	In house	<12		-----	
2161	In house	3.86		-----	
2165	EPA3052	3.9		-----	
2169	IEC62321	<5		-----	
2172	EN1122	3.89		-----	
2175	EPA3052	1.90	C,G(0.01)	-----	First reported 2.62
2179	IEC62321	4.10		-----	
2180	In house	3.54		-----	
2182	EN1122	n.d.		-----	
2184	EN1122	<10		-----	
2190	EN1122	n.d.		-----	
2196	EN1122	<10		-----	
2197	In house	<1		-----	False negative?
2199	EPA3052	3.50		-----	
2201	IEC62321	4.012		-----	
2202	IEC62321	4.8		-----	
2212		-----		-----	
2214	XRF	16	G(0.01)	-----	
2215	EN1122	3.954		-----	
2216		-----		-----	
2227	In house	4.92		-----	
2228	In house	4.0		-----	
2229	In house	3.2		-----	
2231	EPA3052	3.10		-----	
2241	IEC62321	3.89		-----	
2246	In house	<20		-----	
2251		-----		-----	
2253	EPA3051	<5		-----	
2254	In house	3		-----	
2256	EN1122	<5.00		-----	
2257		-----		-----	
2259	IEC62321	3.587		-----	
2260	EN1122	n.d.		-----	
2262		-----		-----	
2310	EN1122	3.8		-----	
2312	EN1122	3.8		-----	
2350	EN1122	3.901		-----	
2353	EN1122	4.1		-----	
2359	EPA3052	4.0		-----	
2362	EN1122	<5.0		-----	
2363	IEC62321	4.2		-----	
2365	IEC62321	4.2		-----	
2366	EN1122	4.3		-----	
2369	EN1122	3.93687		-----	
2370	IEC62321	4.04		-----	
2372	IEC62321	4.0		-----	
2375	IEC62321	n.d.		-----	

2379	IEC62321	3.4		-----	
2380	---	-----		-----	
2385	EN1122	4.0		-----	
3104	EN1122	<10		-----	
3107	In house	9	G(0.01)	-----	
3110	EN1122	<5		-----	
3116	EN1122	<5	C	-----	First reported 5.33
3122	XRF	n.d.		-----	
3124	EPA3052	4.46		-----	
3126	INAA	4.54		-----	
3151	In house	3.43		-----	
3153	IEC62321	4.2		-----	
3154	EN1122	4.108		-----	
3159	EN1122	3.425		-----	
3160	In house	3.60		-----	
3163	XRF	7	G(0.01)	-----	
3166	In house	3.71		-----	
3167	EN1122	4.725		-----	
3169	EN1122	n.d.		-----	
3172	EN1122	<10		-----	
3182	EN1122	4.07		-----	
3185	IEC62321	4.124		-----	
3191	IEC62321	<5		-----	
3192	EN1122	<5		-----	
3199	In house	3.550		-----	
3209	EPA3052	3.76		-----	
3210	EN1122	3.0		-----	
3213	IEC62321	4.02		-----	
3216	EPA3052	3.74		-----	
3218	EN1122	3.94		-----	
3235	EN1122	5		-----	
3246	EPA3051	4.27		-----	
3248	EN1122	<10		-----	
4055	EPA3052	5.24		-----	

normality	OK
n	66
outliers	5
mean (n)	(3.96)
st.dev. (n)	(0.492)
R(calc.)	(1.38)
R(EN1122:01)	(0.99)



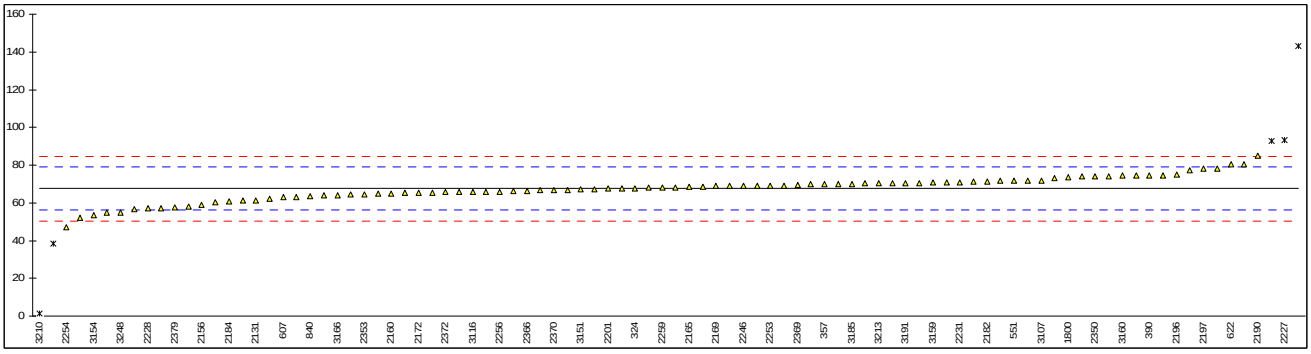


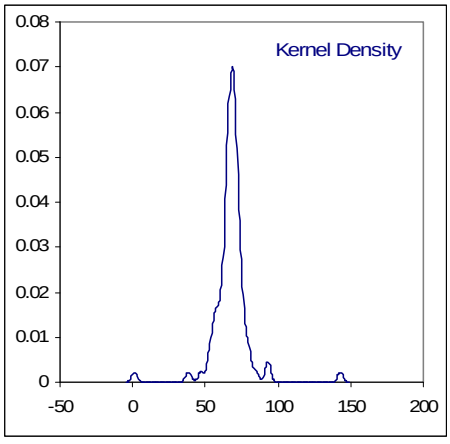
Determination of total Chromium as Cr in PP on sample #0950; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310		-----		-----	
324	IEC62321	67.853		0.06	
330	In house	52.1		-2.69	
339	IEC62321	54.8		-2.22	
357	In house	70		0.44	
390	EPA6020A	74.7		1.26	
453	IEC62321	70.5		0.52	
551	IEC62321	71.73		0.74	
607	EPA3051A	63		-0.79	
622	EN1122	80.40		2.25	
632	IEC62321	68.16		0.12	
840	IEC62321	63.56		-0.69	
1051		-----		-----	
1126		-----		-----	
1195	XRF	64.35		-0.55	
1800	In house	73.7		1.08	
2102	In house	71.15		0.64	
2117	In house	65.4		-0.37	
2129	ASTM E1642	61.1		-1.12	
2131	In house	61.40		-1.06	
2132	In house	58.22		-1.62	
2146		-----		-----	
2156	IEC62321	59.1		-1.47	
2159	In house	67.12		-0.07	
2160	XRF	65.14		-0.41	
2161	In house	66.6		-0.16	
2165	EPA3052	68.5		0.17	
2169	IEC62321	68.851		0.24	
2172	IEC62321	65.31		-0.38	
2175	EPA3052	60.24		-1.27	
2179	IEC62321	71.81		0.75	
2180	In house	70.38		0.50	
2182	EPA3051	71.25		0.65	
2184	In house	60.9		-1.15	
2190	In house	84.9		3.04	
2196	EPA3050 B	75		1.31	
2197	In house	78.2		1.87	
2199	EPA3052	77.47		1.74	
2201	IEC62321	67.44		-0.01	
2202	In house	80.6		2.29	
2212		-----		-----	
2214	XRF	64		-0.61	
2215	EPA3051	67.91		0.07	
2216		-----		-----	
2227	In house	93.35	G(0.05)	4.51	
2228	In house	57	C	-1.83	First reported 355.7
2229	In house	65.3		-0.38	
2231	EPA3052	71.03		0.62	
2241	IEC62321	78.23		1.87	
2246	In house	69.05		0.27	
2251		-----		-----	
2253	EPA3051	69.21		0.30	
2254	In house	47		-3.58	
2256	EPA3051	66.02		-0.26	
2257		-----		-----	
2259	IEC62321	68.1		0.10	
2260	EPA3052	74.6		1.24	
2262		-----		-----	
2310	EPA3052	62.1		-0.94	
2312	EPA3051	64.8		-0.47	
2350	IEC62321	74.00		1.13	
2353	IEC62321	64.6		-0.51	
2359	EPA3052	69.0		0.26	
2362	IEC62321	66.0		-0.26	
2363	IEC62321	70.8		0.58	
2365	IEC62321	74.7		1.26	
2366	EPA3052	66.4		-0.19	
2369	IEC62321	69.5871		0.36	
2370	IEC62321	66.6		-0.16	
2372	IEC62321	65.7		-0.31	
2375	IEC62321	57.3		-1.78	

2379	IEC62321	57.7		-1.71
2380		-----		-----
2385	EPA3052	71.7		0.73
3104	In house	69.12		0.28
3107	In house	72.0		0.79
3110	EPA3052	66.4		-0.19
3116	EPA3051	65.81		-0.29
3122	XRF	143	G(0.01)	13.18
3124	EPA3052	67.7		0.04
3126	INAA	73.1		0.98
3151	In house	67.0		-0.09
3153	EPA3052	63.1		-0.77
3154	In house	53.36		-2.47
3159	EPA3051	70.66		0.55
3160	in house	74.29		1.19
3163	XRF	93	G(0.05)	4.45
3166	In house	64.2		-0.58
3167	IEC62321	74.05		1.14
3169	EPA3051	70.004		0.44
3172	In house	66.8		-0.12
3182		-----		-----
3185	IEC62321	70.03		0.44
3191	IEC62321	70.5		0.52
3192	In house	68.76		0.22
3199	In house	56.74		-1.88
3209	EPA3052	69.93		0.42
3210	EN14602	1.36	G(0.01)	-11.54
3213	IEC62321	70.36		0.50
3216	EPA3052	65.78		-0.30
3218	IEC62321	70.24		0.48
3235	EN1122	74		1.13
3246	EPA3051	69.24		0.30
3248	In house	54.9		-2.20
4055	EPA3052	38.48	G(0.05)	-5.07

		Only XRF+INAA data:
normality	OK	not OK
n	89	4
outliers	5	2
mean (n)	67.50	66.65
st.dev. (n)	6.532	4.328
R(calc.)	18.29	12.12
R(Horwitz)	16.04	15.87



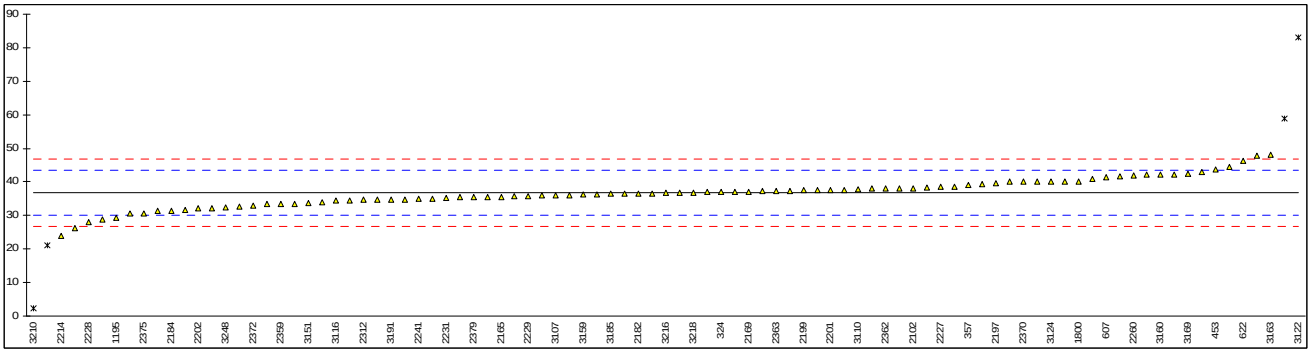


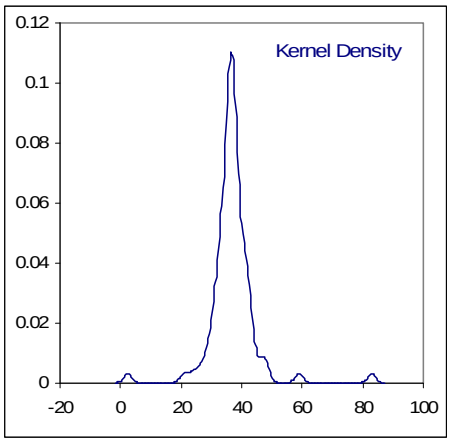
Determination of total Chromium as Cr in PE on sample #0951; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310		-----		-----	
324	IEC62321	37.049		0.10	
330	In house	31.6		-1.50	
339	IEC62321	31.3		-1.59	
357	In house	39		0.67	
390	EPA6020A	37.0		0.08	
453	IEC62321	43.7		2.04	
551	IEC62321	38.30		0.46	
607	EPA3051A	41.5		1.40	
622	EN1122	46.41		2.84	
632	IEC62321	36.64		-0.02	
840	IEC62321	32.27		-1.30	
1051		-----		-----	
1126		-----		-----	
1195	XRF	29.2		-2.20	
1800	In house	40.2		1.02	
2102	In house	38.09		0.40	
2117	In house	35.5		-0.36	
2129	ASTM E1642	28.9		-2.29	
2131	In house	34.8		-0.56	
2132	In house	30.56		-1.80	
2146	EN1122	-----		-----	
2156	IEC62321	36.8		0.02	
2159	In house	36.31		-0.12	
2160	XRF	<24		-----	False negative
2161	In house	38.0		0.38	
2165	EPA3052	35.6		-0.33	
2169	IEC62321	37.067		0.10	
2172	IEC62321	37.05		0.10	
2175	EPA3052	32.58		-1.21	
2179	IEC62321	36.59		-0.04	
2180	In house	42.25		1.62	
2182	EPA3051	36.61		-0.03	
2184	In house	31.3		-1.59	
2190	In house	40.1		0.99	
2196	EPA3050 B	59	G(0.01)	6.52	
2197	In house	39.6		0.84	
2199	EPA3052	37.42		0.21	
2201	IEC62321	37.57		0.25	
2202	In house	32.2		-1.32	
2212		-----		-----	
2214	XRF	24		-3.72	
2215	EPA3051	39.29		0.75	
2216		-----		-----	
2227	In house	38.60		0.55	
2228	In house	28	C	-2.55	First reported 508.3
2229	In house	35.8		-0.27	
2231	EPA3052	35.14		-0.46	
2241	IEC62321	34.89		-0.54	
2246	In house	37.41		0.20	
2251		-----		-----	
2253	EPA3051	38.05		0.39	
2254	In house	34		-0.80	
2256	EPA3051	35.72		-0.29	
2257		-----		-----	
2259	IEC62321	33.4		-0.97	
2260	EPA3052	42.0		1.55	
2262		-----		-----	
2310	EPA3052	37.2		0.14	
2312	EPA3051	34.6		-0.62	
2350	IEC62321	42.09		1.57	
2353	IEC62321	34.9		-0.53	
2359	EPA3052	33.4		-0.97	
2362	IEC62321	38.0		0.38	
2363	IEC62321	37.3		0.17	
2365	IEC62321	44.5		2.28	
2366	EPA3052	34.8		-0.56	
2369	IEC62321	40.1079		0.99	
2370	IEC62321	40.0		0.96	
2372	IEC62321	33		-1.09	
2375	IEC62321	30.6		-1.79	

2379	IEC62321	35.5		-0.36
2380		-----		-----
2385	EPA3052	37.5		0.23
3104	In house	38.68		0.57
3107	In house	36.0		-0.21
3110	EPA3052	37.7		0.29
3116	EPA3051	34.43		-0.67
3122	XRF	83	G(0.01)	13.55
3124	EPA3052	40.1		0.99
3126	IINAA	40.9		1.22
3151	In house	33.8		-0.85
3153	EPA3052	33.4		-0.97
3154	In house	26.175		-3.09
3159	EPA3051	36.16		-0.16
3160	in house	42.17		1.60
3163	XRF	48		3.30
3166	In house	35.9		-0.24
3167	IEC62321	47.73		3.22
3169	EPA3051	42.304		1.64
3172	In house	35.6		-0.33
3182	EPA3052	-----		-----
3185	IEC62321	36.56		-0.05
3191	IEC62321	34.8		-0.56
3192	In house	39.99		0.96
3199	In house	36.10		-0.18
3209	EPA3052	37.58		0.25
3210	EN14602	2.39	G(0.01)	-10.05
3213	IEC62321	34.53		-0.64
3216	EPA3052	36.68		-0.01
3218	IEC62321	36.82		0.03
3235	EN1122	43		1.84
3246	EPA3051	41.60		1.43
3248	In house	32.3		-1.29
4055	EPA3052	21.02	G(0.05)	-4.60

			Only XRF / INAA data:
	normality	OK	OK
	n	89	4
	outliers	4	1
	mean (n)	36.72	35.53
	st.dev. (n)	4.296	10.914
	R(calc.)	12.03	30.56
	R(Horwitz)	9.56	9.30



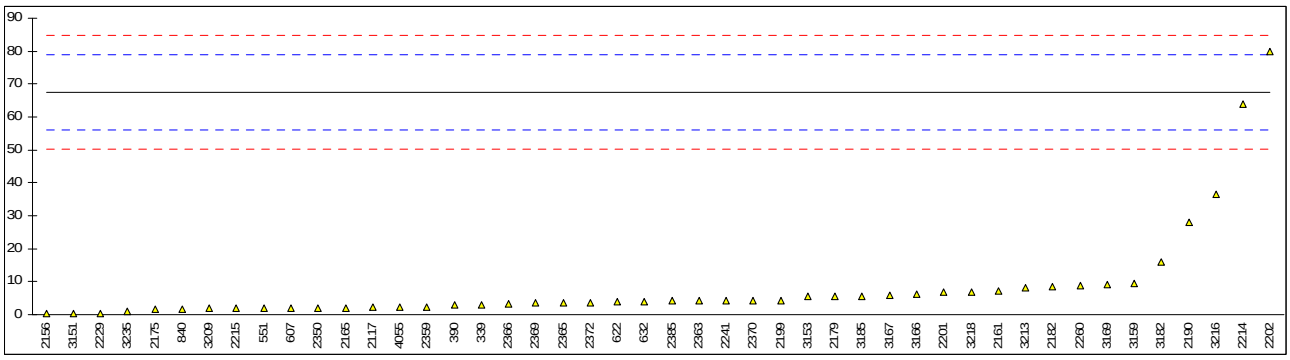


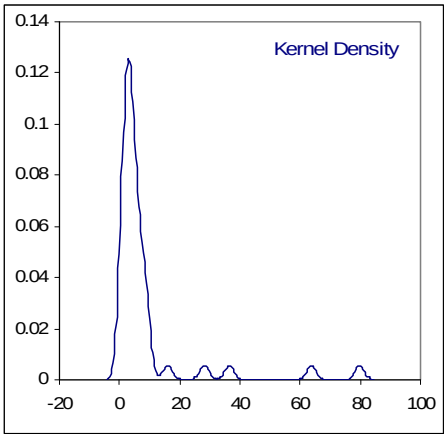
Determination of Hexavalent Chromium as Cr^{6+} in PP on sample #0950; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110	---	-----		-----	
310	---	-----		-----	
324	IEC62321	<0.6		-----	
330	---	-----		-----	
339	IEC62321	3		-11.26	
357	---	-----		-----	
390	IEC62321	3.0		-11.26	
453	---	-----		-----	
551	IEC62321	2	C	-11.43	
607	EPA3060A/7196A	2		-11.43	
622	in house	3.84		-11.11	
632	IEC62321	3.91		-11.10	
840	IEC62321	1.79		-11.47	
1051	---	-----		-----	
1126	---	-----		-----	
1195	---	-----		-----	
1800	---	-----		-----	
2102	---	-----		-----	
2117	IEC62321	2.15		-11.41	
2129	---	-----		-----	
2131	in house	n.d.		-----	
2132	EPA3060A/7196A	<2.0		-----	
2146	---	-----		-----	
2156	IEC62321	0.3		-11.73	
2159	In house	n.d.		-----	
2160	---	-----		-----	
2161	EPA3060A	7.11		-10.54	
2165	IEC62321	2.06		-11.42	
2169	IEC62321	<10		-----	
2172	IEC62321	<2.00		-----	
2175	EPA3060A/7196A	1.65		-11.50	
2179	IEC62321	5.53		-10.82	
2180	---	-----		-----	
2182	EPA3060	8.507		-10.30	
2184	IEC62321	<10		-----	
2190	EPA3060A	28.2		-6.86	
2196	EPA3060A/7196A	<10		-----	
2197	---	-----		-----	
2199	EPA3060A	4.31		-11.03	
2201	IEC62321	6.708		-10.61	
2202	in house	79.8		2.15	
2212	---	-----		-----	
2214	In house	63.78		-0.65	
2215	EPA3060	1.866		-11.46	
2216	---	-----		-----	
2227	---	-----		-----	
2228	---	-----		-----	
2229	IEC62321	0.4		-11.71	
2231	---	-----		-----	
2241	IEC62321	4.21		-11.05	
2246	ISO17075	<3		<-11.26	
2251	---	-----		-----	
2253	---	-----		-----	
2254	In house	<3		<-11.26	
2256	EPA3060A	<2.00		-----	
2257	---	-----		-----	
2259	---	-----		-----	
2260	EPA3060A/7196A	8.8		-10.25	
2262	---	-----		-----	
2310	---	-----		-----	
2312	EPA3060A/7196A	-----		-----	
2350	IEC62321	2.0035		-11.43	
2353	IEC62321	<2		-----	
2359	EPA3060	2.4		-11.36	
2362	EPA3060	<5.0		-----	
2363	IEC62321	4.2		-11.05	
2365	IEC62321	3.6		-11.15	
2366	EPA3060	3.1		-11.24	
2369	IEC62321	3.5515		-11.16	
2370	IEC62321	4.30		-11.03	
2372	IEC62321	3.7		-11.14	
2375	IEC62321	n.d.		-----	

2379	IEC62321	n.d.	-----
2380	---	-----	-----
2385	EPA3060	4.1	-11.07
3104	---	-----	-----
3107	---	-----	-----
3110	EPA3060	<10	-----
3116	EPA3051	<2	-----
3122	---	-----	-----
3124	---	-----	-----
3126	---	-----	-----
3151	DIN53314	0.33	-11.73
3153	IEC62321	5.5	-10.82
3154	---	-----	-----
3159	EPA3060	9.462	-10.13
3160	---	-----	-----
3163	---	-----	-----
3166	EPA7199	6.245	-10.69
3167	IEC62321	5.80	-10.77
3169	IEC62321	9.13615	-10.19
3172	---	-----	-----
3182	IEC62321	16.01	-8.99
3185	IEC62321	5.565	-10.81
3191	IEC62321	<5	-----
3192	---	-----	-----
3199	In house	<2	-----
3209	EPA3060	1.83	-11.46
3210	---	-----	-----
3213	IEC62321	8.15	-10.36
3216	EPA3060A/7196A	36.5	-5.41
3218	IEC62321	6.88	-10.58
3235	IEC62321	1.0	-11.61
3246	IEC62321	n.d.	-----
3248	IEC62321	<3	<-11.26
4055	EPA3060	2.18	-11.40

		All data
normality		not OK
n		46
outliers		0
mean (n)	67.5	8.49
st.dev. (n)		15.227
R(calc.)		42.64
R(Horwitz)	16.0	2.76



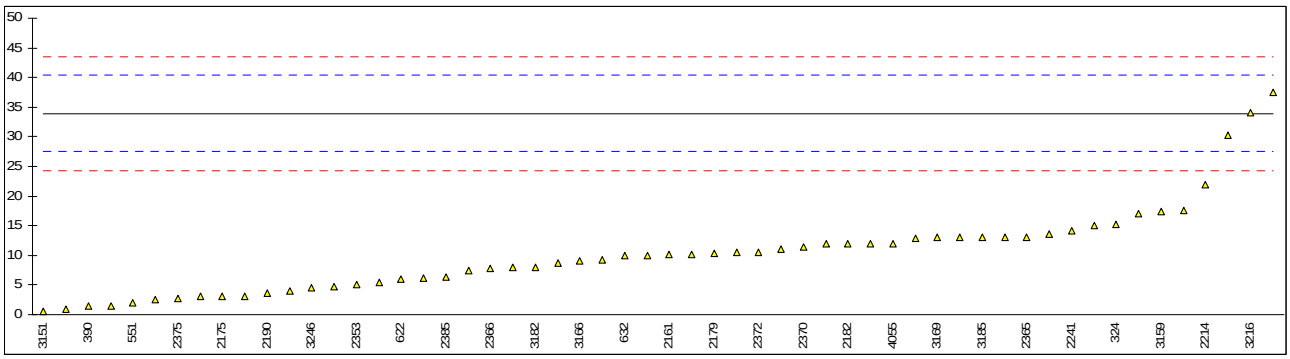


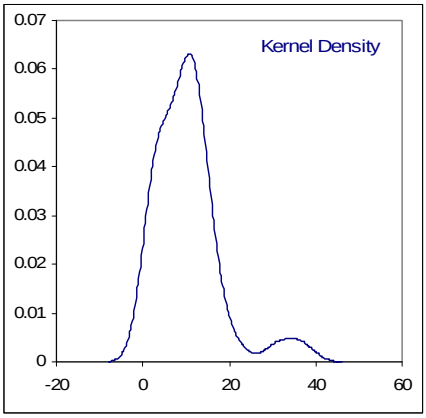
Determination of Hexavalent Chromium as Cr^{6+} in PE on sample #0951; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110	---	-----		-----	
310	---	-----		-----	
324	IEC62321	15.27		-5.84	
330	---	-----		-----	
339	IEC62321	15		-5.93	
357	---	-----		-----	
390	IEC62321	1.4		-10.19	
453	---	-----		-----	
551	IEC62321	2		-10.00	
607	EPA3060A/7196A	7.4		-8.31	
622	in house	5.9		-8.78	
632	IEC62321	10.03		-7.48	
840	IEC62321	4.62		-9.18	
1051	---	-----		-----	
1126	---	-----		-----	
1195	---	-----		-----	
1800	---	-----		-----	
2102	---	-----		-----	
2117	IEC62321	10.04		-7.48	
2129	---	-----		-----	
2131	in house	n.d.		-----	
2132	EPA3060A/7196A	<2.0		<-9.99	
2146	---	-----		-----	
2156	IEC62321	0.9		-10.34	
2159	In house	n.d.		-----	
2160	---	-----		-----	
2161	EPA3060A	10.1		-7.46	
2165	IEC62321	9.25		-7.73	
2169	IEC62321	<10		<-7.49	
2172	IEC62321	10.199		-7.43	
2175	EPA3060A/7196A	3.02		-9.68	
2179	IEC62321	10.24		-7.42	
2180	---	-----		-----	
2182	EPA3060	11.953		-6.88	
2184	IEC62321	13.0		-6.55	
2190	EPA3060A	3.6		-9.50	
2196	EPA3060A/7196A	<10		<-7.49	
2197	---	-----		-----	
2199	EPA3060A	17.50		-5.15	
2201	IEC62321	11.92		-6.89	
2202	in house	30.3		-1.14	
2212	---	-----		-----	
2214	In house	21.9		-3.77	
2215	EPA3060	1.523		-10.15	
2216	---	-----		-----	
2227	---	-----		-----	
2228	---	-----		-----	
2229	IEC62321	3.1		-9.65	
2231	---	-----		-----	
2241	IEC62321	14.21		-6.18	
2246	ISO17075	<3		<-9.68	
2251	---	-----		-----	
2253	---	-----		-----	
2254	In house	<3		<-9.68	
2256	EPA3060A	<2.00		<-9.99	
2257	---	-----		-----	
2259	---	-----		-----	
2260	EPA3060A/7196A	12.9		-6.59	
2262	---	-----		-----	
2310	---	-----		-----	
2312	EPA3060A/7196A	3.0		-9.68	
2350	IEC62321	10.469		-7.35	
2353	IEC62321	5.0		-9.06	
2359	EPA3060	6.2		-8.68	
2362	EPA3060	<5.0		<-9.05	
2363	IEC62321	13.1		-6.52	
2365	IEC62321	13.1		-6.52	
2366	EPA3060	7.8		-8.18	
2369	IEC62321	16.9661		-5.31	
2370	IEC62321	11.5		-7.02	
2372	IEC62321	10.5		-7.34	
2375	IEC62321	2.7		-9.78	

2379	IEC62321	5.4	-8.93
2380	---	-----	-----
2385	EPA3060	6.3	-8.65
3104	---	-----	-----
3107	---	-----	-----
3110	EPA3060	<10	<-7.49
3116	EPA3051	<2	<-9.99
3122	---	-----	-----
3124	---	-----	-----
3126	---	-----	-----
3151	DIN53314	0.50	-10.47
3153	IEC62321	11.0	-7.18
3154	---	-----	-----
3159	EPA3060	17.47	-5.16
3160	---	-----	-----
3163	---	-----	-----
3166	EPA7199	9.033	-7.80
3167	IEC62321	37.52	1.12
3169	IEC62321	12.9635	-6.57
3172	---	-----	-----
3182	IEC62321	8.01	-8.12
3185	IEC62321	13.02	-6.55
3191	IEC62321	8.0	-8.12
3192	---	-----	-----
3199	In house	<2	<-9.99
3209	EPA3060	4.02	-9.37
3210	---	-----	-----
3213	IEC62321	8.68	-7.91
3216	EPA3060A/7196A	34.0	0.02
3218	IEC62321	13.54	-6.39
3235	IEC62321	2.5	-9.84
3246	IEC62321	4.60	-9.18
3248	IEC62321	12.0	-6.87
4055	EPA3060	12.04	-6.85

		All data:
normality		not OK
n		56
outliers		0
mean (n)	33.94	10.33
st.dev. (n)		7.490
R(calc.)		20.97
R(Horwitz)	8.95	3.26



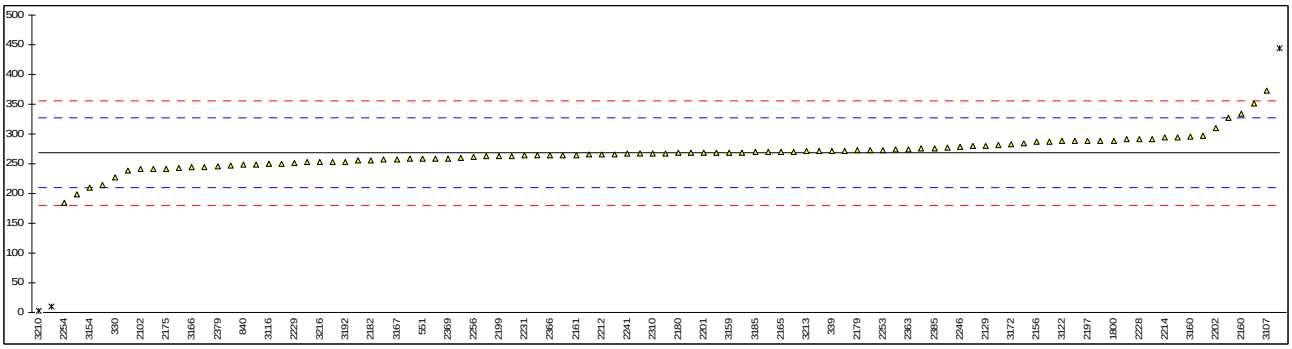


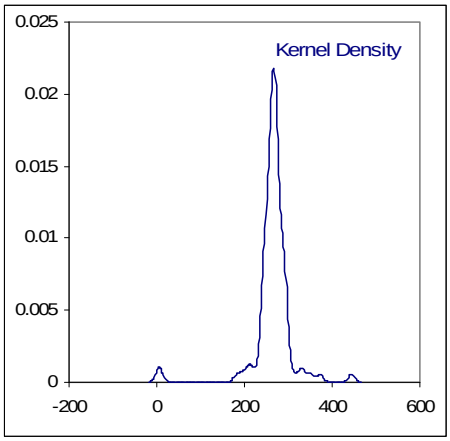
Determination of total Lead as Pb on in PP sample #0950; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310		-----		-----	
324	IEC62321	257.307		-0.43	
330	In house	226.5		-1.65	
339	IEC62321	272		0.15	
357	In house	280		0.47	
390	EPA6020A	295.0		1.06	
453	IEC62321	291.0		0.91	
551	IEC62321	259.10		-0.36	
607	EPA3051A	262.5		-0.23	
622	In house	260.70		-0.30	
632	IEC62321	269.75		0.06	
840	IEC62321	248.21		-0.79	
1051	In house	297.35		1.16	
1126		-----		-----	
1195	XRF	444.30	G(0.05)	6.99	
1800	In house	289.0		0.83	
2102	In house	240.93		-1.08	
2117	In house	263.9		-0.17	
2129	ASTM E1642	280.1		0.47	
2131	In house	289.00		0.83	
2132	In house	240.95		-1.08	
2146		-----		-----	
2156	IEC62321	286.7		0.73	
2159	In house	246.50		-0.86	
2160	XRF	334.4		2.63	
2161	In house	265.0		-0.13	
2165	EPA3052	270.5		0.09	
2169	IEC62321	275.975		0.31	
2172	IEC62321	277.29		0.36	
2175	EPA3052	241.4	C	-1.06	First reported 228.5
2179	IEC62321	272.8		0.18	
2180	In house	268.1		0.00	
2182	EPA3051	256.27		-0.47	
2184	In house	256.1		-0.48	
2190	In house	288.1		0.79	
2196	EPA3052	215		-2.11	
2197	In house	288.7		0.81	
2199	IEC62321	262.65		-0.22	
2201	IEC62321	268.6		0.02	
2202	In house	310.3		1.67	
2212	In house	265.8		-0.09	
2214	XRF	295		1.06	
2215	EPA3051	264.69		-0.14	
2216	In house	269.25		0.04	
2227	In house	351.21		3.30	
2228	In house	291.6		0.93	
2229	In house	252		-0.64	
2231	EPA7473	263.78		-0.17	
2241	IEC62321	266.58		-0.06	
2246	In house	279.09		0.43	
2251		-----		-----	
2253	EPA3051	273.19		0.20	
2254	In house	184		-3.34	
2256	EPA3051	261.72		-0.26	
2257	EPA7471	9.2889	G(0.01)	-10.28	
2259	IEC62321	281.3		0.52	
2260	EPA3052	259.1		-0.36	
2262		-----		-----	
2310	EPA3052	267.0		-0.05	
2312	EPA3051	243.0		-1.00	
2350	IEC62321	265.8		-0.09	
2353	IEC62321	265.9		-0.09	
2359	EPA3052	268.9		0.03	
2362	IEC62321	263.5		-0.19	
2363	IEC62321	274.0		0.23	
2365	IEC62321	250.4		-0.71	
2366	EPA3052	264.5		-0.15	
2369	IEC62321	259.264		-0.35	
2370	IEC62321	253		-0.60	
2372	IEC62321	252.3		-0.63	
2375	IEC62321	268.2		0.00	

2379	IEC62321	246.0		-0.88
2380		-----		-----
2385	EPA3052	276.3		0.32
3104	In house	249.1		-0.76
3107	In house	372.5		4.14
3110	EPA3052	259.0		-0.36
3116	EPA3051	250.19		-0.71
3122	XRF	288		0.79
3124	EPA3052	272		0.15
3126		-----		-----
3151	In house	270.6		0.10
3153	EPA3052	266.6		-0.06
3154	In house	209.8		-2.32
3159	EPA3051	269.0		0.03
3160	in house	296.27		1.11
3163	XRF	327		2.33
3166	In house	244		-0.96
3167	IEC62321	257.5		-0.42
3169	EPA3051	267.29		-0.04
3172	In house	282.6		0.57
3182	EPA3052	287.66		0.77
3185	IEC62321	269.7		0.06
3191	IEC62321	271.6		0.14
3192	In house	253.44		-0.59
3199	In house	239.0		-1.16
3209	EPA3052	284.71		0.66
3210	EN14602	2.9	G(0.01)	-10.53
3213	IEC62321	271.41		0.13
3216	EPA3052	252.52		-0.62
3218	IEC62321	272.9		0.19
3235	IEC62321	292		0.95
3246	EPA3051	273.68		0.22
3248	In house	244.9		-0.92
4055	EPA3052	198.65		-2.76

			Only XRF data:
	normality	not OK	OK
	n	95	4
	outliers	3	1
	mean (n)	268.19	311.10
	st.dev. (n)	26.454	23.011
	R(calc.)	74.07	64.43
	R(D4004:02)	70.54	81.16
Comp.	R(Horwitz)	51.78	58.74



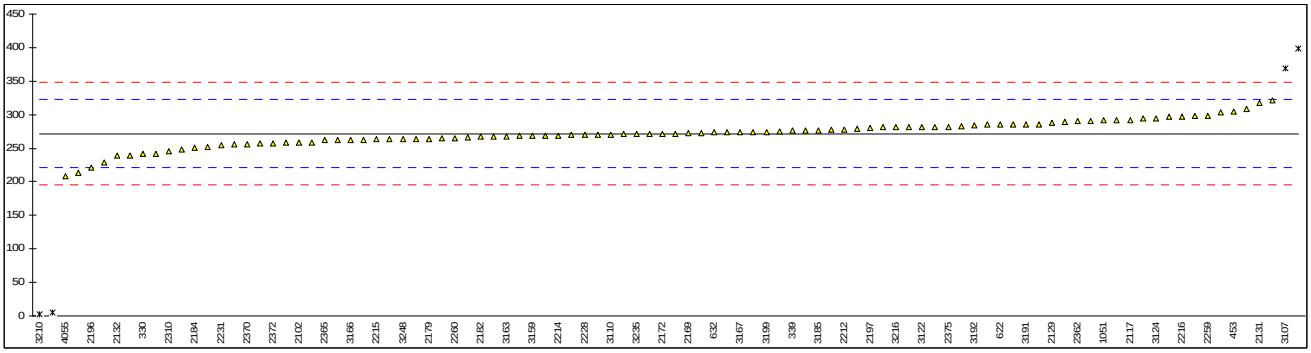


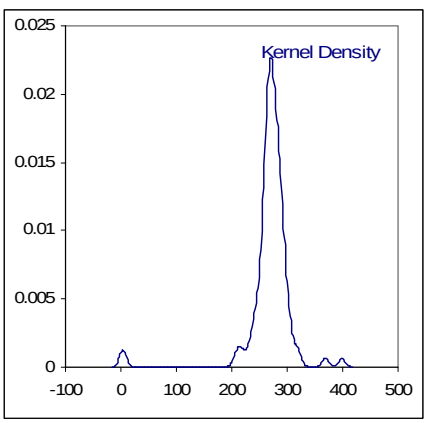
Determination of total Lead as Pb on in PE sample #0951; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310		-----		-----	
324	IEC62321	261.81		-0.39	
330	In house	241.1		-1.20	
339	IEC62321	276		0.17	
357	In house	290		0.72	
390	EPA6020A	285		0.52	
453	IEC62321	304.5		1.28	
551	IEC62321	264.50		-0.28	
607	EPA3051A	267.5		-0.17	
622	In house	285.63		0.54	
632	IEC62321	274.0		0.09	
840	IEC62321	263.87		-0.31	
1051	In house	291.30		0.77	
1126		-----		-----	
1195	XRF	398.8	G(0.05)	4.98	
1800	In house	293.9		0.87	
2102	In house	258.26		-0.53	
2117	In house	291.4		0.77	
2129	ASTM E1642	287.5		0.62	
2131	In house	317.00		1.77	
2132	In house	239.05		-1.28	
2146		-----		-----	
2156	IEC62321	302.9		1.22	
2159	In house	271.24		-0.02	
2160	XRF	239.2		-1.27	
2161	In house	281.7		0.39	
2165	EPA3052	270.2		-0.06	
2169	IEC62321	272.173		0.02	
2172	IEC62321	271.2		-0.02	
2175	EPA3052	228.8		-1.68	
2179	IEC62321	264.07		-0.30	
2180	In house	282.6		0.43	
2182	EPA3051	266.97		-0.19	
2184	In house	251.3		-0.80	
2190	In house	308.8		1.45	
2196	EPA3052	221		-1.99	
2197	In house	280.6		0.35	
2199	IEC62321	265.51		-0.24	
2201	IEC62321	274.6		0.11	
2202	In house	281.9		0.40	
2212	In house	278.3		0.26	
2214	XRF	269		-0.11	
2215	EPA3051	263.27		-0.33	
2216	In house	297.25		1.00	
2227	In house	320.95		1.93	
2228	In house	270.1		-0.06	
2229	In house	258		-0.54	
2231	EPA7473	254.25		-0.69	
2241	IEC62321	269.68		-0.08	
2246	In house	285.67		0.55	
2251		-----		-----	
2253	EPA3051	286.06		0.56	
2254	In house	242		-1.16	
2256	EPA3051	268.36		-0.13	
2257	EPA7471	5.6136	G(0.01)	-10.42	
2259	IEC62321	298.2		1.04	
2260	EPA3052	265.2		-0.26	
2262		-----		-----	
2310	EPA3052	246.0		-1.01	
2312	EPA3051	251.5		-0.79	
2350	IEC62321	262.7		-0.35	
2353	IEC62321	289.4		0.69	
2359	EPA3052	271.0		-0.03	
2362	IEC62321	290.0		0.72	
2363	IEC62321	277.3		0.22	
2365	IEC62321	261.8		-0.39	
2366	EPA3052	268.2		-0.14	
2369	IEC62321	258.816		-0.51	
2370	IEC62321	256		-0.62	
2372	IEC62321	257		-0.58	
2375	IEC62321	282		0.40	

2379	IEC62321	248.0		-0.93
2380		-----		-----
2385	EPA3052	282.0		0.40
3104	In house	263.4		-0.33
3107	In house	369.5	G(0.01)	3.83
3110	EPA3052	270.3		-0.06
3116	EPA3051	256.54		-0.60
3122	XRF	282		0.40
3124	EPA3052	294		0.87
3126		-----		-----
3151	In house	279.5		0.30
3153	EPA3052	274.3		0.10
3154	In house	213		-2.30
3159	EPA3051	268.3		-0.13
3160	in house	291.38		0.77
3163	XRF	268		-0.15
3166	In house	262		-0.38
3167	IEC62321	274.2		0.10
3169	EPA3051	255.45		-0.64
3172	In house	274.0		0.09
3182	EPA3052	296.60		0.97
3185	IEC62321	277.0		0.21
3191	IEC62321	286.0		0.56
3192	In house	284.67		0.51
3199	In house	274.5		0.11
3209	EPA3052	298.10		1.03
3210	EN14602	2.0	G(0.01)	-10.57
3213	IEC62321	272.77		0.04
3216	EPA3052	281.71		0.39
3218	IEC62321	270.7		-0.04
3235	IEC62321	271		-0.03
3246	EPA3051	276.69		0.19
3248	In house	263.5		-0.32
4055	EPA3052	208.66		-2.47

			<u>Only XRF data:</u>
	normality	not OK	OK
	n	94	4
	outliers	4	1
	mean (n)	271.74	264.55
	st.dev. (n)	19.872	18.063
	R(calc.)	55.64	50.58
	R(D4004:02)	71.48	69.59
Comp	R(Horwitz)	52.37	51.19



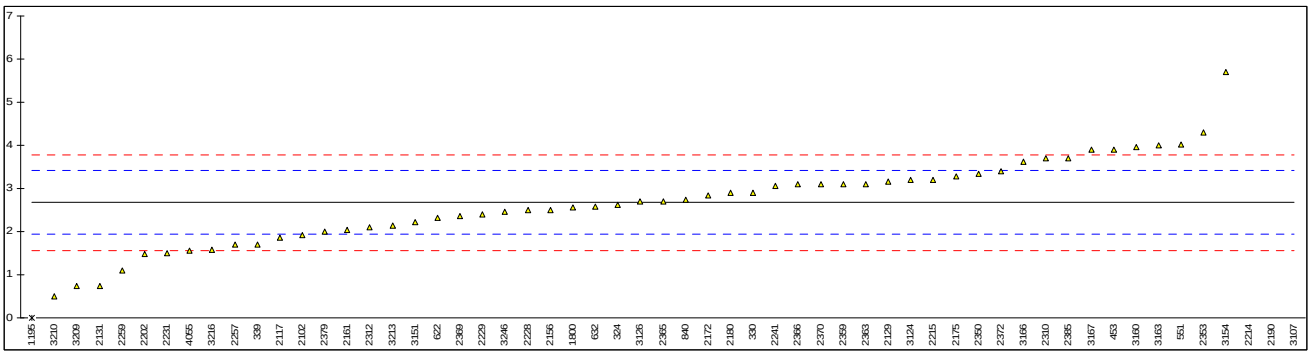


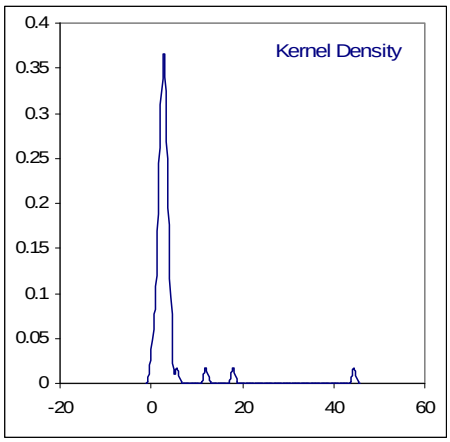
Determination of Mercury as Hg in PP on sample #0950; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310		-----		-----	
324	IEC62321	2.626		-0.13	
330	In house	2.9		0.61	
339	IEC62321	1.7		-2.64	
357	In house	<1		<-4.54	False negative
390	EPA6020A	-----		-----	
453	IEC62321	3.9		3.32	
551	IEC62321	4.01		3.62	
607	EPA3051A	<2		-----	
622	In house	2.33		-0.93	
632	IEC62321	2.579		-0.26	
840	IEC62321	2.75		0.20	
1051		-----		-----	
1126		-----		-----	
1195	XRF	0	ex	-7.25	Result excluded, not a real result
1800	In house	2.57		-0.28	
2102	In house	1.92		-2.04	
2117	In house	1.85		-2.23	
2129	ASTM E1642	3.15		1.29	
2131	In house	0.75		-5.21	
2132	In house	<10.0		<19.93	
2146		-----		-----	
2156	IEC62321	2.5		-0.47	
2159	In house	n.d.		-----	
2160	XRF	<12		<25.36	
2161	In house	2.05		-1.69	
2165	EPA3052	<10		<19.93	
2169	IEC62321	<10		<19.93	
2172	IEC62321	2.84		0.45	
2175	EPA3052	3.28		1.64	
2179	IEC62321	n.d.		-----	
2180	In house	2.89		0.58	
2182	EPA3051	n.d.		-----	
2184	In house	<10		<19.93	
2190	In house	18.0	C,G(0.01)	41.53	First reported 36.0
2196	EPA3052	<10		<19.93	
2197		-----		-----	
2199	IEC62321	<2.0		<-1.83	
2201	IEC62321	<2		<-1.83	
2202	In house	1.47		-3.26	
2212		-----		-----	
2214	XRF	12	G(0.01)	25.27	
2215	EPA3051	3.198		1.42	
2216		-----		-----	
2227	In house	-----		-----	
2228	In house	2.5		-0.47	
2229	In house	2.4		-0.74	
2231	EPA7473	1.507		-3.16	
2241	IEC62321	3.06		1.04	
2246	In house	<20		<47.11	
2251		-----		-----	
2253	EPA3051	<5		<6.33	
2254	In house	<1		<-4.54	False negative?
2256	EPA3051	<5.00		<6.33	
2257	EPA7471	1.6920		-2.66	
2259	IEC62321	1.09		-4.29	
2260	EPA3052	n.d.		-----	
2262		-----		-----	
2310	EPA3052	3.7		2.78	
2312	EPA3051	2.1		-1.56	
2350	IEC62321	3.34	C	1.80	First reported <2
2353	IEC62321	4.3		4.41	
2359	EPA3052	3.1		1.15	
2362	IEC62321	<5.0		<6.33	
2363	IEC62321	3.1		1.15	
2365	IEC62321	2.7		0.07	
2366	EPA3052	3.1		1.15	
2369	IEC62321	2.357		-0.86	
2370	IEC62321	3.10		1.15	
2372	IEC62321	3.4		1.97	
2375	IEC62321	n.d.		-----	

2379	IEC62321	2.0		-1.83
2380		-----		-----
2385	EPA3052	3.7		2.78
3104	In house	<5		<6.33
3107	In house	44.5	G(0.01)	113.34
3110	EPA3052	<5		<6.33
3116	EPA3051	<5		<6.33
3122		-----		-----
3124	EPA3052	3.19		1.40
3126	IINAA	2.7		0.07
3151	In house	2.22		-1.23
3153	EPA3052	<10		<19.93
3154	In house	5.695		8.19
3159	EPA3051	<10		<19.93
3160	in house	3.95		3.46
3163	XRF	4		3.59
3166	In house	3.62		2.56
3167	IEC62321	3.890		3.29
3169	EPA3051	n.d.		-----
3172	In house	<10		<19.93
3182	EPA3052	<20		<47.11
3185	IEC62321	<10		<19.93
3191	IEC62321	<5		<6.33
3192		-----		-----
3199	In house	< 10		<19.93
3209	EPA3052	0.74		-5.24
3210	EN14602	0.5		-5.89
3213	IEC62321	2.14		-1.45
3216	EPA3052	1.57		-2.99
3218	IEC62321	<2		<-1.83
3235	IEC62321	<5		<6.33
3246	EPA3051	2.46		-0.58
3248	In house	<10		<19.93
4055	EPA3052	1.56		-3.02

normality	OK
n	53
outliers	4
mean (n)	2.67
st.dev. (n)	0.993
R(calc.)	2.78
R(Horwitz)	1.03



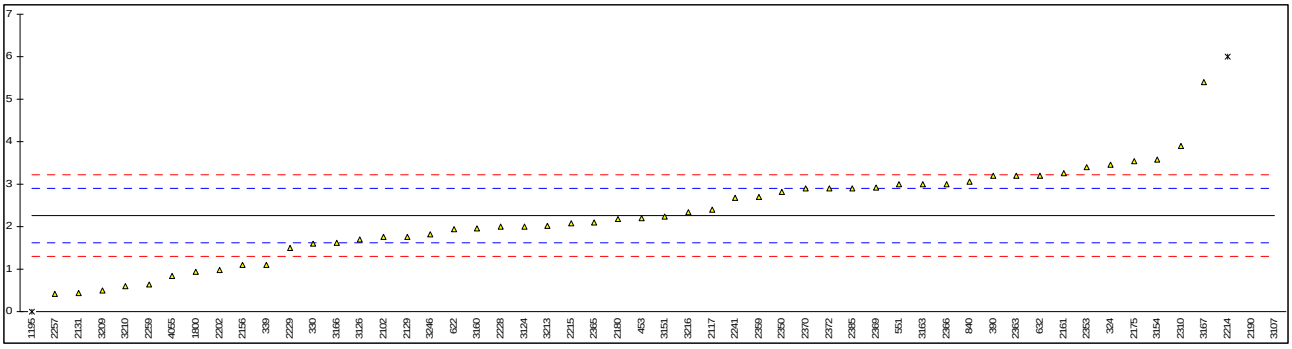


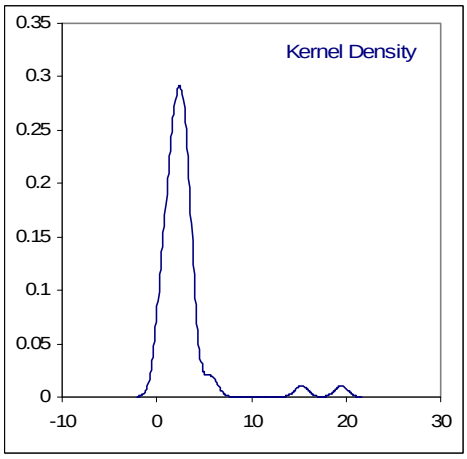
Determination of Mercury as Hg in PE on sample #0951; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
310		-----		-----	
324	IEC62321	3.456		3.75	
330	In house	1.6		-2.06	
339	IEC62321	1.1		-3.62	
357	In house	<1		<-3.96	False negative
390	EPA6020A	3.2		2.95	
453	IEC62321	2.2		-0.18	
551	IEC62321	3.00		2.33	
607	EPA3051A	n.d.		-----	
622	In house	1.94		-0.99	
632	IEC62321	3.2091		2.98	
840	IEC62321	3.07		2.55	
1051		-----		-----	
1126		-----		-----	
1195	XRF	0	ex	-7.06	Result excluded not a real result
1800	In house	0.94		-4.12	
2102	In house	1.76		-1.55	
2117	In house	2.40		0.45	
2129	ASTM E1642	1.77		-1.52	
2131	In house	0.45		-5.66	
2132	In house	<10.0		<24.35	
2146		-----		-----	
2156	IEC62321	1.1		-3.62	
2159	In house	n.d.		-----	
2160	XRF	<12		<30.64	
2161	In house	3.27		3.17	
2165	EPA3052	<10		<24.35	
2169	IEC62321	<10		<24.35	
2172	IEC62321	<2		<-0.80	
2175	EPA3052	3.54		4.02	
2179	IEC62321	n.d.		-----	
2180	In house	2.17		-0.27	
2182	EPA3051	n.d.		-----	
2184	In house	<10		<24.35	
2190	In house	15.3	C,G(0.01)	40.83	First reported 30.6
2196	EPA3052	<10		<24.35	
2197		-----		-----	
2199	IEC62321	<2.0		<-0.80	
2201	IEC62321	<2		<-0.80	
2202	In house	0.98		-4.00	
2212		-----		-----	
2214	XRF	6	G(0.05)	11.72	
2215	EPA3051	2.076		-0.57	
2216		-----		-----	
2227	In house	-----		-----	
2228	In house	2.0		-0.80	
2229	In house	1.5	C	-2.37	First reported <2
2231	EPA7473	-----		-----	
2241	IEC62321	2.67		1.29	
2246	In house	<20		-----	
2251		-----		-----	
2253	EPA3051	<5		<8.62	
2254	In house	<1		<-3.96	False negative
2256	EPA3051	<5.00		<8.62	
2257	EPA7471	0.4108		-5.78	
2259	IEC62321	0.646		-5.04	
2260	EPA3052	n.d.		-----	
2262		-----		-----	
2310	EPA3052	3.9		5.14	
2312	EPA3051	n.d.		-----	
2350	IEC62321	2.82	C	1.76	First reported <2
2353	IEC62321	3.4		3.58	
2359	EPA3052	2.7		1.39	
2362	IEC62321	<5		<8.62	
2363	IEC62321	3.2		2.95	
2365	IEC62321	2.1		-0.49	
2366	EPA3052	3.0		2.33	
2369	IEC62321	2.92		2.08	
2370	IEC62321	2.90		2.01	
2372	IEC62321	2.9		2.01	
2375	IEC62321	n.d.		-----	

2379	IEC62321	n.d.		-----
2380		-----		-----
2385	EPA3052	2.9		2.01
3104	In house	<5		<8.62
3107	In house	19.5	G(0.01)	53.98
3110	EPA3052	<5		<8.62
3116	EPA3051	<5		<8.62
3122		-----		-----
3124	EPA3052	2.00		-0.80
3126	IINAA	1.69		-1.77
3151	In house	2.25		-0.02
3153	EPA3052	<10		<24.35
3154	In house	3.576		4.13
3159	EPA3051	<10		<24.35
3160	in house	1.95		-0.96
3163	XRF	3		2.33
3166	In house	1.63		-1.96
3167	IEC62321	5.408		9.87
3169	EPA3051	n.d.		-----
3172	In house	<10		<24.35
3182	EPA3052	<20		-----
3185	IEC62321	<10		<24.35
3191	IEC62321	<5		<8.62
3192		-----		-----
3199	In house	<10		<24.35
3209	EPA3052	0.50		-5.50
3210	EN14602	0.6		-5.19
3213	IEC62321	2.02		-0.74
3216	EPA3052	2.35		0.29
3218	IEC62321	n.d.		-----
3235	IEC62321	<5		<8.62
3246	EPA3051	1.82		-1.37
3248	In house	<10		<24.35
4055	EPA3052	0.84		-4.43

normality	OK
n	50
outliers	4
mean (n)	2.26
st.dev. (n)	1.042
R(calc.)	2.92
R(Horwitz)	0.89





APPENDIX 2

Analytical details regarding total Chromium determination

Lab	Analysis method	Technique used to release the metals	Acid / acid mixture used	Solid/liquid ratio (g/mL)	Technique to detect & quantify	Corrected for rec.
110	---	---	---	---	---	---
310	---	---	---	---	---	---
324	IEC62321	Acid digestion with microwave	HNO3/HF	0.25/50	ICP-MS	no
330	In house	Acid digestion with microwave	HNO3, H2O2	0.1/5	ICP	---
339	IEC62321	Acid digestion	H2SO4, H2O2	0.5/50	ICP	no
357	In house	Acid digestion with microwave	HNO3	0.3/10	ICP	no
390	EPA6020A	Acid digestion with microwave	HNO3,H2O2	0.01/1	ICP-MS	no
453	IEC62321	Acid digestion with microwave	HNO3	0.25/25	ICP	no
551	IEC62321	Acid digestion with microwave	HNO3	0.25/25	ICP	no
607	EPA3051A	Acid digestion with microwave	HNO3	1/40	ICP	no
622	EN1122	acid digestion	HNO3,H2SO4,H2O2	0.5/50	AAS	no
632	IEC62321	---	---	---	---	---
840	IEC62321	Acid digestion with microwave	HNO3	0.2/10	ICP	no
1051	---	---	---	---	---	---
1126	---	---	---	---	---	---
1195	XRF	ED-XRF	---	---	XRF	---
1800	In house	Acid digestion with microwave	HNO3	0.15/3	ICP	no
2102	In house	Acid digestion with microwave	HNO3	0.1/7	ICP-MS	no
2117	In house	Acid digestion with microwave	HNO3	0.2/10	ICP-MS	no
2129	ASTM E1642	Acid digestion with microwave	HNO3	0.2/5	ICP-MSD	no
2131	In house	Acid digestion	HNO3	1/25	ICP-MS	no
2132	In house	Acid digestion with microwave	HNO3	0.1/5	ICP-OES	no
2146	---	---	---	---	---	---
2156	IEC62321	Acid digestion with microwave	HNO3,H2O2	0.5/100	ICP	no
2159	In house	Acid digestion with microwave	HNO3,H2O2	---	ICP-MS	yes
2160	XRF	ED-XRF	---	0.9/10-	XRF	no
2161	In house	acid decomposition	HNO3,H2SO4,HCl	0.025/1	ICP	no
2165	EPA3052	Acid digestion with microwave	HNO3	0.1/10	ICP	no
2169	IEC62321	Acid digestion with microwave	HNO3	0.05/5	ICP-MS	no
2172	IEC62321	Acid digestion with microwave	HNO3	---	ICP	no
2175	EPA3052	Acid digestion with microwave	HNO3, HCl	0.25/7	ICP	no
2179	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.1/10-	ICP	no
2180	In house	Acid digestion with microwave	HNO3	0.03/1	ICP	no
2182	EPA3051	Acid digestion with microwave	HNO3	0.03/1	ICP	no
2184	In house	Acid digestion with microwave	HNO3	0.002/1	ICP	no
2190	In house	Acid digestion with microwave	HNO3	0.5/100	ICP	no
2196	EPA3050 B	acid digestion	HNO3	0.2/25	ICP	no
2197	In house	Acid digestion with microwave	HNO3, H2O2	0.3/11	ICP	no
2199	EPA3052	---	---	---	---	---
2201	IEC62321	Acid digestion with microwave	HNO3	0.1/8	ICP	no
2202	In house	Acid digestion with microwave	HNO3, HF	0.15/40	ICP	yes
2212	---	---	---	---	---	---
2214	XRF	XRF	---	---	XRF	---
2215	EPA3051	Acid digestion	H2SO4	---	AAS	no
2216	---	---	---	---	---	---
2227	In house	Acid digestion with microwave	HNO3	0.15/10	ICP	no
2228	In house	Acid digestion with microwave	HNO3	0.2/25	ICP-MS	no
2229	In house	Acid digestion with microwave	HNO3, H2O2	0.1/15	ICP	no
2231	EPA3052	Acid digestion with microwave	HNO3	0.25/25	ICP	yes
2241	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.1/7	ICP	no
2246	In house	Acid digestion with microwave	HNO3	0.15/5	ICP	no
2251	---					no
2253	EPA3051	Acid digestion with microwave	HNO3	0.16/10	ICP	yes
2254	In house	Acid digestion with microwave	HNO3, HCl, H2O2	0.2/50	ICP	no
2256	EPA3051	Acid digestion with microwave	HNO3, H2O2	0.02/1	ICP	yes
2257	---					no
2259	IEC62321	Acid digestion with microwave	HNO3	0.2/5	ICP	no
2260	EPA3052	Acid digestion with microwave	HNO3, H2O2	1/50	ICP	no
2262	---					no
2310	EPA3052	Acid digestion with microwave	HNO3,H2O2	1/100	ICP	no
2312	EPA3051	Acid digestion with microwave	HNO3	1/1000	ICP-MS	no
2350	IEC62321	Acid digestion with microwave	HNO3, HF, H2O2	0.2/25	ICP	no
2353	IEC62321	Acid digestion with microwave	HNO3	0.2/10	ICP	no
2359	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.1/10	ICP	yes
2362	IEC62321	Acid digestion with microwave	HNO3	0.1/50	ICP	no
2363	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.25/25	ICP	no

2365	IEC62321	Acid digestion with microwave	HNO3, H2O2, H3BF4)	0.2/25	ICP	no
2366	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.1/10	ICP	no
2369	IEC62321	Acid digestion with microwave	HNO3	0.25/25	ICP	no
2370	IEC62321	Acid digestion with microwave	HNO3	0.1/5	ICP	no
2372	IEC62321	Acid digestion with microwave	HNO3, HF, HCl	0.2/13.5	ICP	no
2375	IEC62321	Acid digestion with microwave	HNO3	0.1/10	ICP-MS	no
2379	IEC62321	Acid digestion with microwave	HNO3, H2O2	2.5/10	ICP	no
2380	---	---	---	---	---	---
2385	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.2/6	ICP	no
3104	In house	Acid digestion with microwave	HNO3, HCl	0.1/100	AAS	no
3107	In house	Acid digestion with microwave	HNO3	0.15/15	ICP	no
3110	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.15/25	ICP	no
3116	EPA3051	Acid digestion with microwave	HNO3	0.1/25	ICP	no
3122	XRF	XRF	---	---	XRF	no
3124	EPA3052	Acid digestion with microwave	HNO3, HF, HCL	0.25/11	ICP-MS	no
3126	IINAA	INAA	---	---	INAA	---
3151	In house	Acid digestion with microwave	HNO3	0.1/3.5	ICP-MS	no
3153	EPA3052	Acid digestion with microwave	HNO3	0.02/1	ICP	no
3154	In house	Acid digestion with microwave	HNO3	0.2/8	ICP	no
3159	EPA3051	Acid digestion with microwave	HNO3, H2O2	0.1/11	ICP	no
3160	in house	Acid digestion with microwave	HNO3, H2O2, HCl	0.3/12	ICP	no
3163	XRF	XRF	---	---	XRF	no
3166	In house	Acid digestion with microwave	HNO3	0.2/3	ICP-MS	no
3167	IEC62321	Acid digestion with microwave	HNO3	0.1/25	ICP	no
3169	EPA3051	Acid digestion with microwave	HNO3	0.15/5	ICP	no
3172	In house	Acid digestion with microwave	HNO3	0.1/8	ICP	no
3182	EPA3052	Acid digestion with microwave	HNO3	0.1/10	ICP	no
3185	IEC62321	Acid digestion with microwave	HNO3	0.2/25	ICP	no
3191	IEC62321	Acid digestion with microwave	HNO3, H2O2	1/250	ICP	no
3192	In house	Acid digestion with microwave	HNO3	---	ICP	no
3199	In house	Acid digestion with microwave	HNO3, H2O2	0.2/11	ICP	no
3209	EPA3052	Acid digestion with microwave	HNO3	1/50	ICP	no
3210	EN14602		HNO3, HCl	1.5/50	ICP	no
3213	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.2/8	ICP-MS	no
3216	EPA3052	Acid digestion with microwave	HNO3	0.5/10	ICP-MS	no
3218	IEC62321	Acid digestion with microwave	HNO3, H2O2, HF	0.2/10	ICP	no
3235	EN1122	Acid digestion	H2SO4	0.3/10	ICP	no
3246	EPA3051	Acid digestion with microwave	HNO3	0.2/20	ICP	no
3248	In house	Acid digestion with microwave	HNO3, H2O2	0.15/11	AAS, ICP	yes
4055	EPA3052	Acid digestion with microwave	HNO3	0.25/10	AAS-flame	no

Analytical details regarding total Mercury determination

Lab	Analysis method	Technique to used release the metals	Acid / acid mixture used	Solid/liquid ratio (g/mL)	Technique to detect & quantify	Corrected for rec.
110	---	---	---	---	---	---
310	---	---	---	---	---	---
324	IEC62321	Acid digestion with microwave	HNO3/HF	0.25/50	ICP-MS	no
330	In house	Acid digestion with microwave	HNO3, H2O2	0.1/5	ICP	---
339	IEC62321	Acid digestion	H2SO4, H2O2	0.5/50	CV AF	no
357	In house	Acid digestion with microwave	HNO3	0.3/10	CV AAS	no
390	EPA6020A	Acid digestion with microwave	HNO3,H2O2	0.01/1	ICP-MS	no
453	IEC62321	Acid digestion with microwave	HNO3	0.25/25	ICP	no
551	IEC62321	Acid digestion with microwave	HNO3	0.25/25	ICP	no
607	EPA3051A	Acid digestion with microwave	HNO3	1/40	ICP	no
622	In house	acid digestion	HNO3,H2SO4	0.5/100	AAS	no
632	IEC62321	---	---	---	---	---
840	IEC62321	Acid digestion with microwave	HNO3	0.2/10	ICP	no
1051	---	---	---	---	---	---
1126	---	---	---	---	---	---
1195	XRF	ED-XRF	---	---	XRF	---
1800	In house	Acid digestion with microwave	HNO3	0.15/3	AAS	no
2102	In house	Acid digestion with microwave	HNO3	0.1/7	ICP-MS	no
2117	In house	Acid digestion with microwave	HNO3	0.2/10	AAS	no
2129	ASTM E1642	Acid digestion with microwave	HNO3	0.2/5	ICP-MSD	no
2131	In house	Acid digestion	HNO3	1/25	ICP-MS	no
2132	In house	Acid digestion with microwave	HNO3	0.1/5	ICP-OES	no
2146	---	---	---	---	---	---
2156	IEC62321	Acid digestion with microwave	HNO3,H2O2	0.5/100	ICP	no
2159	In house	Acid digestion with microwave	HNO3,H2O2	---	ICP-MS	yes
2160	XRF	ED-XRF	---	0.9/10	XRF	no
2161	In house	Heating vaporizing	---	---	AAS	no
2165	EPA3052	Acid digestion with microwave	HNO3	0.1/10	ICP	no
2169	IEC62321	Acid digestion with microwave	HNO3	0.05/5	ICP-MS	no
2172	IEC62321	Acid digestion with microwave	HNO3	---	ICP	no
2175	EPA3052	Acid digestion with microwave	HNO3, HCl	0.25/7	Hg analyzer	no
2179	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.1/10-	ICP	no
2180	In house	Acid digestion with microwave	HNO3	0.03/1	CV AFS	no
2182	EPA3051	Acid digestion with microwave	HNO3	0.03/1	ICP	no
2184	In house	Acid digestion with microwave	HNO3	0.002/1	ICP	no
2190	In house	Acid digestion with microwave	HNO3	0.5/100	ICP	no
2196	EPA3052	Acid digestion with microwave	HNO3, H2O2, HCl	0.2/25	ICP	no
2197	---	---	---	---	---	---
2199	IEC62321	---	---	---	---	---
2201	IEC62321	Acid digestion with microwave	HNO3	0.1/8	ICP	no
2202	In house	Acid digestion with microwave	HNO3, HF	0.15/40	Hg analyzer	no
2212	---	---	---	---	---	---
2214	XRF	XRF	---	---	XRF	---
2215	EPA3051	Acid digestion	HNO3	---	ICP	no
2216	---	---	---	---	---	---
2227	In house	Acid digestion with microwave	HNO3	0.15/10	ICP	no
2228	In house	Acid digestion with microwave	HNO3	0.2/25	ICP-MS	no
2229	In house	Acid digestion with microwave	HNO3, H2O2	0.1/15	ICP	no
2231	EPA7473	---	---	---	Hg analyzer	---
2241	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.1/7	Hg analyzer	no
2246	In house	Acid digestion with microwave	HNO3	0.15/5	ICP	no
2251	---	---	---	---	---	no
2253	EPA3051	Acid digestion with microwave	HNO3	0.16/10	ICP	yes
2254	In house	Acid digestion with microwave	HNO3, HCl, H2O2	0.2/50	VGC	no
2256	EPA3051	Acid digestion with microwave	HNO3, H2O2	0.02/1	ICP	yes
2257	EPA7471	Acid digestion with microwave	HNO3, HCl	1/25	CV AA	no
2259	IEC62321	Acid digestion with microwave	HNO3	0.2/5	ICP	no
2260	EPA3052	Acid digestion with microwave	HNO3, H2O2	1/50	ICP	no
2262	---	---	---	---	---	no
2310	EPA3052	Acid digestion with microwave	HNO3,H2O2	1/100	ICP	no
2312	EPA3051	Acid digestion with microwave	HNO3	1/1000	ICP-MS	no
2350	IEC62321	Acid digestion with microwave	HNO3, HF, H2O2	0.2/25	ICP	no
2353	IEC62321	Acid digestion with microwave	HNO3	0.2/10	ICP	no
2359	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.1/10	ICP	yes
2362	IEC62321	Acid digestion with microwave	HNO3	0.1/50	ICP	no
2363	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.25/25	ICP	no
2365	IEC62321	Acid digestion with microwave	HNO3, H2O2, H3BF4	0.2/25	DMA	no

2366	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.1/10	DMA	no
2369	IEC62321	Acid digestion with microwave	HNO3	0.25/25	DMA	no
2370	IEC62321	Acid digestion with microwave	HNO3	0.1/5	ICP	no
2372	IEC62321	Acid digestion with microwave	HNO3, HF, HCl	0.2/13.5	ICP	no
2375	IEC62321	Acid digestion with microwave	HNO3	0.1/10	ICP-MS	no
2379	IEC62321	Acid digestion with microwave	HNO3, H2O2	2.5/10	ICP	no
2380	---	---	---	---	---	---
2385	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.2/6	CV AAS	no
3104	In house	Acid digestion with microwave	HNO3, HCl	0.1/100	AAS	no
3107	In house	Acid digestion with microwave	HNO3	0.15/15	ICP	no
3110	EPA3052	Acid digestion with microwave	HNO3, H2O2	0.15/25	ICP	no
3116	EPA3051	Acid digestion with microwave	HNO3	0.1/25	ICP	no
3122	---	---	---	---	---	---
3124	EPA3052	Acid digestion with microwave	HNO3, HF, HCL	0.25/11	ICP-MS	no
3126	IINAA	INAA	---	---	INAA	---
3151	In house	Acid digestion with microwave	HNO3	0.1/3.5	ICP-MS	no
3153	EPA3052	Acid digestion with microwave	HNO3	0.02/1	ICP	no
3154	In house	Acid digestion with microwave	HNO3	0.2/8	AAS hydride	no
3159	EPA3051	Acid digestion with microwave	HNO3, H2O2	0.1/11	ICP	no
3160	in house	Acid digestion with microwave	HNO3, H2O2, HCl	0.3/12	Hg ICP	no
3163	XRF	XRF	---	---	XRF	no
3166	In house	Acid digestion with microwave	HNO3	0.2/3	ICP-MS	no
3167	IEC62321	Acid digestion with microwave	HNO3	0.1/25	ICP	no
3169	EPA3051	Acid digestion with microwave	HNO3	0.15/5	ICP	no
3172	In house	Acid digestion with microwave	HNO3	0.1/8	ICP	no
3182	EPA3052	Acid digestion with microwave	HNO3	0.1/10	ICP	no
3185	IEC62321	Acid digestion with microwave	HNO3	0.2/25	ICP	no
3191	IEC62321	Acid digestion with microwave	HNO3, H2O2	1/250	AAS	no
3192	---	---	---	---	---	---
3199	In house	Acid digestion with microwave	HNO3, H2O2	0.2/11	ICP	no
3209	EPA3052	Acid digestion with microwave	HNO3	1/50	ICP	no
3210	EN14602		HNO3, HCl	1.5/50	SFA	no
3213	IEC62321	Acid digestion with microwave	HNO3, H2O2	0.2/8	ICP-MS	no
3216	EPA3052	Acid digestion with microwave	HNO3	0.5/10	ICP-MS	no
3218	IEC62321	Acid digestion with microwave	HNO3, H2O2, HF	0.2/10	ICP	no
3235	IEC62321	Acid digestion	HNO3	0.1/5	ICP	no
3246	EPA3051	Acid digestion with microwave	HNO3	0.2/20	AAS	no
3248	In house	Acid digestion with microwave	HNO3, H2O2	0.15/11	AAS, ICP	yes
4055	EPA3052	Acid digestion with microwave	HNO3	0.25/10	Hg hydride	no

Analytical details regarding Hexavalent Chromium determination

Lab	Analysis method	Size of reduced sample	Solvent	ratio g/mL	Extraction conditions	Corr for recov.	Other details
110	---	---	---	---	---	---	---
310	---	---	---	---	---	---	---
324	IEC62321	250 µm	NaOH + Na2CO3	1/100	90-95°C @3hrs	no	---
330	---	---	---	---	---	---	
339	IEC62321	250 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	yes	---
357	---	---	---	---	---	---	
390	IEC62321	---	NaOH + Na2CO3	---	90-95°C @1hr	no	---
453	---	---	---	---	---	---	---
551	IEC62321	---	NaOH + Na2CO3	2/50	90-95°C @3hrs	no	---
607	EPA3060A/7196A	1 mm³	NaOH + Na2CO3	1/20	90-95°C @1hr	no	---
622	in house	1 mm	NaOH + Na2CO3	0.5/50	90-95°C @1hr	no	---
632	IEC62321	---	---	---	---	---	---
840	IEC62321	1 mm³	NaOH + Na2CO3	1.2/50	90-95°C @3hrs	no	---
1051	---	---	---	---	---	---	---
1126	---	---	---	---	---	---	---
1195	---	---	---	---	---	---	---
1800	---	---	---	---	---	---	---
2102	---	---	---	---	---	---	---
2117	IEC62321	500 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---
2129	---	---	---	---	---	---	---
2131	in house	---	Acidic perspiration	2.5/50	40°C @1hr Ultra sonic	no	---
2132	EPA3060A/7196A	500 µm	NaOH + Na2CO3	2/50	90-95°C @1hr	no	---
2146	---	---	---	---	---	---	---
2156	IEC62321	1 mm³	NaOH + Na2CO3	2.5/100	90-95°C @3hrs	no	---
2159	In house	5 mm³	1-Diphenylcarbazid	1/50	Room temp @3hrs	yes	---
2160	---	---	---	---	---	---	---
2161	EPA3060A	by frost shattering	NaOH + Na2CO3	2/100	90-95°C @1hr	no	---
2165	IEC62321	500 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---
2169	IEC62321	250 µm	NaOH + Na2CO3	0.5/100	90-95°C @3hrs	no	---
2172	IEC62321	1mm	NaOH + Na2CO3	1/100	90-95°C @3hrs	no	---
2175	EPA3060A/7196A	8 mm³	NaOH + Na2CO3	1/50	90-95°C @3hrs	no	---
2179	IEC62321	500 µm	NaOH	1/50	90-95°C @3hrs	no	---
2180	---	---	---	---	---	---	---
2182	EPA3060	500 µm	NaOH + Na2CO3	2/100	90-95°C @1hr	no	---
2184	IEC62321	milling	NaOH + Na2CO3	2/100	90-95°C @3hrs	no	---
2190	EPA3060A	2x2x2mm	NaOH + Na2CO3	1.5/100	90-95°C @1hr	no	---
2196	EPA3060A/7196A	500µm	NaOH + Na2CO3	1/100	90-95°C @1hr	no	---
2197	---	---	---	---	---	---	---
2199	EPA3060A	cut to thin film	NaOH + Na2CO3	1/100	95°C @1hr	no	---
2201	IEC62321	250 µm	NaOH + Na2CO3	1.5/100	90-95°C @3hrs	no	---
2202	in house	samples were not powdered	chlorobenzene, THF, NMP & NaOH + Na2SO3	0.15/60	150°C @1hr., 95°C @1hr	no	---
2212	---	---	---	---	---	---	---
2214	In house	---	---	---	---	---	---
2215	EPA3060	5x5mm	Alkaline digestion	---	90-95°C @3hrs..	no	---
2216	---	---	---	---	---	---	---
2227	---	---	---	---	---	---	---
2228	---	---	---	---	---	---	---
2229	IEC62321	---	---	1/15	90-95°C @3hrs	no	---
2231	---	---	---	---	---	---	---
2241	IEC62321	500 µm	NaOH + Na2CO3	1/25	90-95°C @3hrs	no	---
2246	ISO17075	3x3mm	Phosphate buffer	2/100	Room temp @3hrs	no	---
2251	---	---	---	---	---	---	---
2253	---	---	---	---	---	---	---
2254	In house	powder	NaOH + Na2CO3	2.5/50	90-95°C @2hrs	no	Plastic did not dissolve
2256	EPA3060A	Original size	NaOH + Na2CO3	1/100	90-95°C @1hr	Yes	---
2257	---	---	---	---	---	---	---
2259	---	---	---	---	---	---	---
2260	EPA3060A/7196A	500µm	NaOH + Na2CO3	1/50	90-95°C @1hr	no	---
2262	---	---	---	---	---	---	---
2310	---	---	---	---	---	---	---
2312	EPA3060A/7196A	---	NaOH, Na2CO3 digestion sol.	1/50	90°C @3hrs	no	---
2350	IEC62321	500µm	NaOH + Na2CO3	1.5/25	90-95°C @1hr	no	---
2353	IEC62321	500 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---
2359	EPA3060	2x2x2mm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	yes	---
2362	EPA3060	500 µm	NaOH + Na2CO3	2.5/50	90-95°C @1hr	no	---
2363	IEC62321	250 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---

2365	IEC62321	250 µm	NaOH + Na2CO3	2.5/100	90-95°C @3hrs	no	---
2366	EPA3060	2x2x2mm	NaOH + Na2CO3	1/50	90-95°C @1hr	no	---
2369	IEC62321	250 µm	NaOH + Na2CO3	1/250	90-95°C @3hrs	no	---
2370	IEC62321	500 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---
2372	IEC62321	500 µm	NaOH + Na2CO3	2.5/100	90-95°C @3hrs	no	---
2375	IEC62321	250 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---
2379	IEC62321	500 µm	NaOH + Na2CO3	0.8/25	90-95°C @3hrs	no	---
2380	---	---	---	---	---	---	---
2385	EPA3060	1 mm	NaOH + Na2CO3	---	90-95°C @1hr	no	---
3104	---	---	---	---	---	---	---
3107	---	---	---	---	---	---	---
3110	EPA3060	2x2x2mm	NaOH + Na2CO3	0.2/50	90-95°C @1hr	no	---
3116	EPA3051	---	NaOH + Na2CO3	0.5/50	90-95°C @3hrs	no	---
3122	---	---	---	---	---	---	---
3124	---	---	---	---	---	---	---
3126	---	---	---	---	---	---	---
3151	DIN53314	5x5 mm	NaOH	0.5/50	90-95°C @1hr	no	---
3153	IEC62321	250 µm	NaOH + Na2CO3	5/100	90-95°C @3hrs	no	---
3154	---	---	---	---	---	---	---
3159	EPA3060	0.1 mm	NaOH + Na2CO3	0.5/50	90-95°C @1hr	no	---
3160	---	---	---	---	---	---	---
3163	---	---	---	---	---	---	---
3166	EPA7199	1 mm	NaOH + Na2CO3	0.5/50	90-95°C @1hr	no	---
3167	IEC62321	1 mm	NaOH + Na2CO3	1/100	90-95°C @1.5hr	no	---
3169	IEC62321	250 µm	NaOH + Na2CO3	1/100	90-95°C @3hrs	no	---
3172	---	---	---	---	---	---	---
3182	IEC62321	250 µm	NaOH + Na2CO3	2.5/50	90-95°C @3hrs	no	---
3185	IEC62321	250 µm	NaOH + Na2CO3	1.25/25	90-95°C @3hrs	no	---
3191	IEC62321	500µm	NaOH + Na2CO3	1/50	90-95°C @3hrs	no	---
3192	---	---	---	---	---	---	---
3199	In house	3x3mm	NaOH + Na2CO3	0.5/50	90-95°C @1hr	no	---
3209	EPA3060	0.5 mm	NaOH + Na2CO3	1/40	90-95°C @1hr	no	---
3210	---	---	---	---	---	---	---
3213	IEC62321	milling	NaOH + Na2CO3	0.5/50	90-95°C @1hr	no	---
3216	EPA3060A/7196A	original	NaOH + Na2CO3	1.5/50	90-95°C @1hr	no	---
3218	IEC62321	250 µm	NaOH + Na2CO3	1/50	90-95°C @3hrs	no	---
3235	IEC62321	2x2 mm	NaOH + Na2CO3	2.2/50	90-95°C @3hrs	no	---
3246	IEC62321	500 µm	Deionized water	1/10	100°C @10 min	no	---
3248	IEC62321	1x1 mm	NaOH + Na2CO3	1/200	90-95°C @3hrs	yes	---
4055	EPA3060	0.25 mm	NaOH + Na2CO3	1/12.5	90-95°C @1hr	no	---

APPENDIX 3

Number of participating laboratories per country

1 laboratory in BANGLADESH
1 laboratory in BELGIUM
2 laboratories in BRASIL
1 laboratory in DENMARK
2 laboratories in FINLAND
5 laboratories in FRANCE
7 laboratories in GERMANY
14 laboratories in HONG KONG
2 laboratories in INDIA
1 laboratory in INDONESIA
1 laboratory in ISRAEL
2 laboratories in ITALY
3 laboratories in JAPAN
2 laboratories in KOREA
3 laboratories in MALAYSIA
1 laboratory in MEXICO
23 laboratories in P.R. of CHINA
2 laboratories in PHILIPPINES
2 laboratories in SINGAPORE
1 laboratory in SOUTH KOREA
3 laboratories in SPAIN
2 laboratories in SWITZERLAND
2 laboratories in TAIWAN R.O.C.
3 laboratories in THAILAND
5 laboratories in THE NETHERLANDS
3 laboratories in TURKEY
7 laboratories in U.S.A.
3 laboratories in UNITED KINGDOM
2 laboratories in VIETNAM

APPENDIX 4

Abbreviations:

C = final result after checking of first reported suspect result
D(0.01) = outlier in Dixon's outlier test
D(0.05) = straggler in Dixon's outlier test
G(0.01) = outlier in Grubbs' outlier test
G(0.05) = straggler in Grubbs' outlier test
DG(0.01) = outlier in Double Grubbs' outlier test
DG(0.05) = straggler in Double Grubbs' outlier test
n.a. = not applicable

Literature:

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8 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
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