Results of Proficiency Test
Nickel Release
May 2016

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Nickel has always been used in various applications, as a pure metal, as a plated substance on another metal or as an alloy. Nickel applications usually do not give problems, but when Nickel comes into prolonged and direct contact with the human skin, sensitization can occur. When a person becomes sensitive to Nickel, even the smallest amounts can provoke an allergic reaction. By this, Nickel is the most frequent cause of contact allergy in Europe. Both the contact itself (sometimes enhanced by damaged skin) and skin conditions as sweat can cause the body to be exposed to Nickel. In order to decrease the amount of people that become sensitized, Nickel containing items that are used in prolonged human contact are tested for Nickel release. These products involve products like jewellery in piercings (ear rings), other jewellery, watches or clothes fasteners, such as buttons and belts.
On request of several participants, the Institute of Interlaboratory Studies decided to organise an interlaboratory study for the determination of Nickel release in the annual testing program since 2014. This PT was continued each following year.
In this interlaboratory study 126 laboratories in 30 different countries have registered for participation. See appendix 7 for the number of participants per country. In this report, the test results of the 2016 proficiency test are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organiser of this proficiency test (PT). Sample analyses for fit-for-use and homogeneity testing were subcontracted. It was decided to send three pieces of one sample (labelled #16575), positive on Nickel release and a stainless steel spoon (labelled #16576) for surface determination only. Participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation. Also an inventory was made of the analytical details of the used test method, by means of a questionnaire, which was included in the report form.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on ISO/IEC 17043:2010. This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentiality of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on a regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of April 2014 (iis-protocol, version 3.3). This protocol is electronically available through the iis website www.iisnl.com, from the FAQ page.

2.3 CONFIDENTIALITY STATEMENT

All data presented 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

Nickel Release Determination

The samples were purchased from a local supplier and consisted of square metal pieces with a hole in one of the corners. The pieces were massive, prepared from one alloy and not plated. The dimensions of each sample were approximately 1.2 x 1.2 x 0.2 cm and the hole had a diameter of approx 4 mm. Samples were labelled #16575.
Nine stratified randomly selected samples were tested using EN1811:2011 and single test results were averaged per three to check the homogeneity of the batch. The test results of the homogeneity tests are shown in table 1.

	Nickel release (µg/cm^2/week) averaged per 3
sample #16575-1	2.409
sample #16575-2	2.460
sample #16575-3	2.491

Table 1: homogeneity test results of subsamples #16575

From the above test results the repeatability was calculated and compared with 0.3 times the corresponding reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2, in the next table:

	Nickel release (µg/cm^2/week)
r (observed)	0.116
reference test method	EN1811:2011
0.3 x R (reference test method)	0.245

Table 2: evaluation of the repeatability of subsamples #16575

The calculated repeatability was in agreement with 0.3 times the corresponding reproducibility of the reference test method. Therefore, homogeneity of the sub samples was assumed.

Surface Determination

The samples were purchased from a local supplier and consisted of stainless steel spoons, all of the same model. The samples were labelled #16576. No homogeneity tests were done because only surface determination has been requested for this sample.

Three items of sample #16575 and one item of sample #16576 were sent to each of the participating laboratories on May 11, 2016.

2.5 ANALYSES

The participants were requested to determine Nickel release on sample #16575 and the total surface only on sample #16576, applying the analysis procedure that is routinely used in the laboratory.

To get comparable test results a detailed report form, on which the units were prescribed, and a letter of instructions were prepared and made available on the data entry portal www.kpmd.co.uk/sgs-iis-cts/. The report form included also a questionnaire about details of the test method used in order to identify, if possible, analytical details that may have influence on the test results. Also a letter of instructions and a form to confirm receipt of the samples were added to the sample package.

3 RESULTS

During five weeks after sample dispatch, the test results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis-cts/. The reported test results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.
Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test 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 reported test results (no reanalysis). Additional or corrected test results are used for data analysis and original test results are placed under 'Remarks' in the test result tables in appendix 1. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report ‘iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation’ of April 2014 (iis-protocol, version 3.3).
For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as ‘<…’ or ‘>…’ were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either ‘unknown’, ‘OK’, ‘suspect’ or ‘not OK’. After removal of outliers, this check was repeated. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation of the test results should be used with due care.

According to ISO 5725 the original test results per determination were submitted to Dixon’s, Grubbs’ and/or Rosner’s outlier tests. Outliers are marked by D(0.01) for the Dixon’s test, by G(0.01) or DG(0.01) for the Grubbs’ test and by R(0.01) for the Rosner’s test. Stragglers are

marked by D(0.05) for the Dixon's test, by G(0.05) or DG(0.05) for the Grubbs' test and by R(0.05) for the Rosner's test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.
For each assigned value the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. When the uncertainty passed the evaluation, no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

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 test results are plotted. The corresponding laboratory numbers are on 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 reference test method. 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 is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also a normal Gauss curve was projected over the Kernel Density Graph for reference.

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, e.g. ASTM reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8.

When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate whether the reported test result is fit-for-use.
The z-scores were calculated according to:

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

The $z_{(target)}$ scores are listed in the test result tables in appendix 1.
Absolute values for $z<2$ are very common and absolute values for $z>3$ are very rare.

The usual interpretation of z-scores is as follows:

| z | < 1	good
1 < | z | < 2	satisfactory
2 < | z | < 3	questionable
3 < | z |	unsatisfactory

4 EVALUATION

During the execution of this proficiency test no significant problems were encountered. From the 126 participants, six participants reported test results after the deadline for reporting and one participant did not report any test results at all. In total 125 laboratories reported 124 Nickel Release test results. Observed were 8 outlying test results, which is 6.5%. In proficiency studies outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER SAMPLE

In this section, the reported test results are discussed per sample. All statistical results reported on the sample are summarised in appendix 1. The abbreviations used in these tables are listed in appendix 8.

The reproducibility used for the Nickel Release determination was taken from Annex B of the test method EN1811:2011. It states: “The relative test method reproducibility in this ILC was 33.3%”.

Sample #16575: Nickel release:

The determination of Nickel release at a concentration level of 1.12 µg/cm^2/week was problematic. Eight statistical outliers were observed and six test results were excluded for several reasons (see appendix 1). The calculated reproducibility after rejection of the suspect data is not in agreement with EN1811:2011.

Sample #16576: Surface Determination:

The surface determination of the spoon may not problematic. No statistical outliers were observed in the reported range of 28.54 – 37.48 cm^2. No official test method exists for surface determination; therefore no statistical conclusions were drawn.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as found for the group of participating laboratories and the estimated reproducibility of EN1811:2011 (R_{target}) in the next table:

Parameter	*unit*	*n*	*average*	*2.8 * sd*	*R (target)*
Nickel release	µg/cm^2/week	110	1.12	0.57	0.37
Surface Determination					
- #16575-1	cm^2	122	3.950	0.252	n.a.
- #16575-2	cm^2	119	3.948	0.250	n.a.
- #16575-3	cm^2	115	3.948	0.254	n.a.

Table 3: reproducibilities of test results on sample #16575

From table 3 it can be concluded, without further statistical calculations, that the group of participating laboratories had problems with the analysis of Nickel release, when compared to the target reproducibility of the EN1811 test method.

Parameter	*unit*	*n*	*average*	*2.8 * sd*	*R (target)*
Surface Determination	cm^2	118	32.8	4.5	n.a.

Table 4: reproducibility of test results on sample #16576

4.3 COMPARISON OF THE PROFICIENCY TEST OF MAY 2016 WITH PREVIOUS PTS

	May 2016	*May 2015*	*May 2014*
Number of reporting labs	125	123	111
Number of test results reported	124	119	222
Statistical outliers	8	11	4
Percentage outliers	6.5%	9.8%	1.8%

Table 5: comparison with previous proficiency tests (Nickel Release determination only)

In proficiency tests, outlier percentages of 3% - 7.5% are quite normal.

In table 6 the observed uncertainties in this PT are compared with the uncertainties as observed in the previous PTs.

	May 2016	*May 2015*	*May 2014*	*target EN1811*
Nickel Release	18%	28%	27-31%	12%
Surface Determination	2.3-4.9%	1.7%	9-10%	n.a.

Table 6: comparison of uncertainties (relative in %) of this PT and previous PTs

A quality improvement is clearly visible in the Nickel Release determination as the uncertainty did decrease significantly compared to previous PTs. However the 2016 uncertainty is still larger than the strict target derived from EN1811. The uncertainty of the surface determination of sample #16576 (spoon) is twice of sample #16575 (metal plate) which is not bad considered the more complex surface of the spoon compared to the squared metal plate.

5 DISCUSSION OF REPORTED TEST METHOD DETAILS

On the report form of sample #16575 the test results of the various analytical steps could be reported, like the initial volume of the test solution, the final volume of the test solution, the contact area used and the Nickel concentration in the release solution after one week. These data has been summarized in appendices 2 - 5. On the report form of sample #16575 could be explained how the surface of the spoon has be determined. The reported details are given in appendix 6.

Area of contact surface Ni release:
In total 120 laboratories reported the surface area used, see appendix 4. The reported surface area for sample #16575 varied from 2.997 to 4.151 cm^2. After exclusion of two statistical outlying data the surface range narrowed from 3.67 to 4.151 cm^2. The two deviating surface areas have also significant effect on the Ni release determination; one was a statistical outlier and the other was excluded from the statistical evaluation of the Ni release evaluation, see appendix 4.
The observed RSD of 2.3% of contact surface determination after the rejection of the two outliers is slightly worse than observed in 2015 but much better than in the first Nickel Release PT of 2014. In this PT the overall $RSD_{nickel\ release}$ is 18.3% for sample #16575. Overall is the sum of the variation in contact surface determination and the variation in the Nickel determination. The observed variation in the contact surface in this PT is less than 1% of the overall $RSD_{nickel\ release.}$ This has also been observed when the reported Nickel release has been normalized to the same contact surface. The overall $RSD_{nickel\ release}$ remains the same (18.6%). It can be concluded that the variation in the surface determination of this (simple squared) object does not affect the overall variation of the Nickel release determination.

Volume of the start solution:
It was observed that some participants were confused about what was meant by the question on the “volume of start solution”. Some participants interpreted this question as the total of the prepared artificial sweat solution and reported for example 500 ml. The test method of EN1811:2011 prescribes that the start test solution used should be 1 ml per cm^2 surface area, which is in this PT about 4 ml. The participants had received a check mail when the reported volume was higher than 5 ml or below 3 ml.
Finally, in total 124 laboratories reported a start volume of the test solution, see appendix 4. The vast majority of the participants (74%) reported a ratio of 1 ml/cm^2. Two participants confused the calculation of the ratio and reported in cm^2/ml instead of ml/cm^2. For example reported was 0.8 ml/cm^2 but iis calculated 1.25 ml/cm^2 which is 0.8 **cm^2/ml**, see appendix 3. The total range of ratios was 0.5 – 13.0 ml/cm^2. The range of initial volumes was, after correction based on the responses upon the check email, finally 2 – 50 ml. After exclusion of 15 statistically outlying ratios (of which 10 ratios were above 2 ml/cm^2) the ratio range narrowed from 0.9 to 1.3 ml/cm^2. The average ratio after exclusion of the outlying ratios is 1.00 ml/cm^2, with a RSD = 1% based on the reported ratios and the RSD=9% based on the calculated ratios by iis. The higher RSD of the calculated ratio demonstrates again the misinterpretation in the question “volume of start solution”.
The Nickel release test result with the very low ratio (0.5, too low start volume) and three test results with very high ratios (>3.7, about 4 times the needed start volume) were excluded from the statistical evaluation of the Ni release evaluation, see appendix 1.

Final volume of the test solution:

For this parameter it was also observed that some participants were confused about what was meant by the question “final volume (after dilution) of end solution which was used for analysis”. One participant reported even a lower volume for this parameter than for the “volume of start solution”. The corresponding Ni release test result was a statistical outlier. Some participants reported the same volume as the “volume of start solution”.
After the sample has been stored in the release solution for a week, the sample is taken out and the solution is diluted with Nitric acid solution. A very high dilution of the test solution may introduce extra variation on the Nickel release test result. The measurement may become more difficult if a lower concentration is diluted to a large volume. However test method EN1811:2011 prescribes not what the maximal dilution should be. Therefore no check e-mail was sent for this parameter.
In total 123 laboratories reported the final volume (after dilution) of end solution, see appendix 4. About 53% of the participants did use 10 ml as final volume. The total range of volumes reported was 4 (!) to 200 ml. After exclusion of 11 statistically outlying data (all 40 ml or higher, which is a dilution of 10 times or more), the volume range narrowed from 4 to 25 ml. The average volume is 11.4 ml, with a standard deviation of 6.0 ml and RSD = 53%. The observed RSD for this parameter is the same as in 2015 (RSD=55%). Therefore the same conclusion is drawn that some improvement may still be possible for this parameter.
No clear relation is observed between the reported final volume and reported Ni release. Therefore no Ni release test results are excluded based on this parameter.

Calculation of Ni release:

The question about the final volume (after dilution) of end solution and determined contact surface was used to calculate the Ni release according to equation 1 on page 12 of EN1811:2011. Based on the reported data the Ni release could be calculated from 122 participants. In total iis could reproduce the Ni release from 102 participants (84%). From one participant iis had calculated a ten times higher Ni release and therefore this test result was excluded. Remarkable was that 25% had reported the Ni concentration in mg/L, while µg/L was requested to be used on the report form of the data entry tool.

Pre-treatment of vessel:

The vessel, used for leaving the sample in the sweat solution for a week, should be pre-treated with 5% Nitric acid for at least 4 hrs, see paragraph 6.4 of EN1811:2011. This is done to remove any Nickel present from an earlier determination. About 22% the participants reported to have done a pre-treatment with 5% (or higher) HNO3, but 49% of the participants did not use any pre-treatment. When no pre-treatment is used, there will be a risk that the test result for Nickel release will be higher. To check whether some effect is visible, the test results of the laboratories that did not use any pre-treatment were compared with the test results after acid treatment of at least 4 hrs., see table 7.

	No pre-treatment	*≥ 5%HNO3 pre-treatment for ≥4hrs*
Number of test results	61	28
Statistical outliers	5	1
Excluded data	5	1
Average in	1.09 µg/cm^2/week	1.17 µg/cm^2/week
Standard deviation	0.237 µg/cm^2/week	0.203 µg/cm^2/week
RSD%	22%	17%

Table 7: influence of pre-treatment of test vessel

Indeed the effect of the acid pre-treatment is visible, mainly in the variation. The variation in the test results from a vessel that was not pre-treated is higher than the test results from a pre-treated test vessel. Also the number of suspect data (sum of outliers and excluded test results) is more than twice in the test results that was not pre-treated. Clearly a significant quality improvement may be possible for this parameter.
Please note: in the group who had reported not to pre-treat the vessel could still had cleaned the vessel with dilute acid but after the previous Nickel release determination and store this vessel as such before the next determination. Obviously this will also prevent Nickel carry-over.

Sample degreasing:
The majority of the participants (79%) reported to degrease the sample with detergent solution.

Composition of the sweat solution:
Almost all participants (93%) reported to adjust the pH value of the solution to 6.50 ± 0.05. The actual pH reported varies from 5.5 – 6.55. The statistically outlying pH = 5.5 did not result in a significantly deviating Nickel release and was therefore not excluded from the statistical evaluation of the Ni release evaluation. The average pH=6.50 with RSD=0.3%.

Analysis technique:
The majority of the participants (62%) used ICP-OES to measure the Nickel in the sweat solution. Others used ICP-MS (33%) and a few used (GF)AAS (2%). No significant differences were observed between ICP-OES and ICP-MS.

Use of replicates:
Almost all participants (90%) reported test results for the 3 sample items. From the 3 intermediate test results, the relative standard deviation of the repeatability (RSD_r) per laboratory was calculated, see appendix 2.
The RSD_r vary strongly from extremely small (0%) to very large (73%). Only 16 laboratories had a RSD_r in agreement with the target repeatability standard deviation of 4%, estimated from EN1811 (33.3% / 2.8 / 3). The RSD_r of no less than 96 laboratories was larger than 4%.

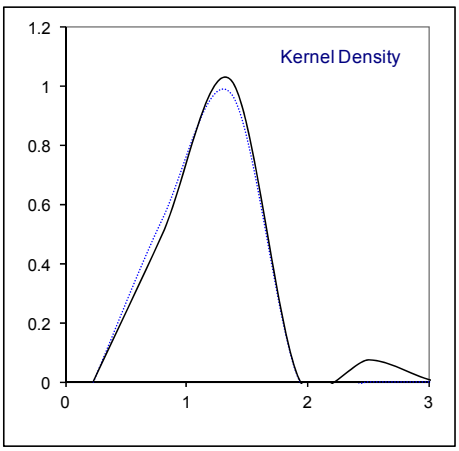
APPENDIX 1

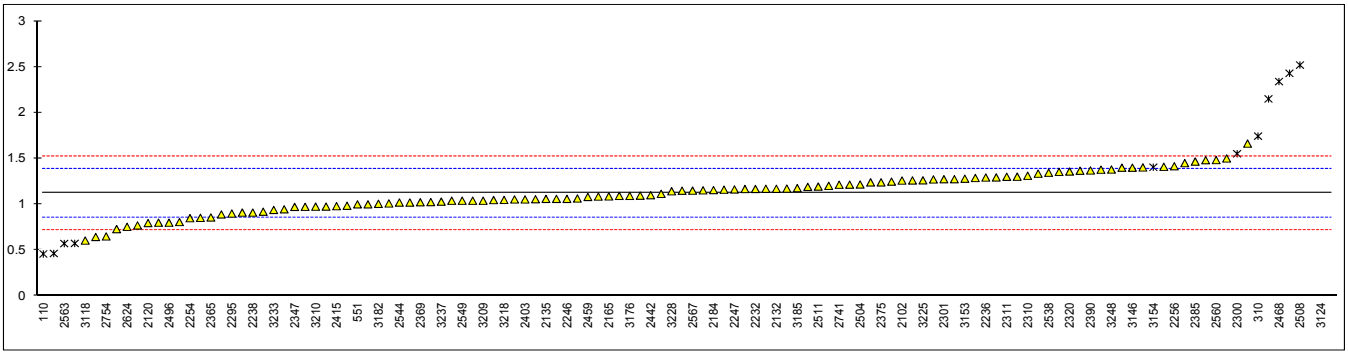
Determination of Nickel Release sample #16575; average result of three replicates in µg/cm^2/week

lab	method	value	mark	z(targ)	remarks
110	EN1811	0.4589	R(0.05)	-4.97	
213	EN1811 + AC	0.80		-2.41	
310	EN1811	1.744	R(0.05)	4.66	
339	EN1811 + AC	1.288	C	1.24	first reported: 1.627
348	EN1811 + AC	1.335		1.60	
362	EN1811	1.294		1.29	
551		1.00	C	-0.91	iis calculated average test result
623	EN1811 + A1	0.9846		-1.03	
840	EN1811	1.01		-0.84	
2102	In house	1.26003		1.03	
2115	EN1811	1.40		2.08	
2120	EN1811 + AC	0.796		-2.44	reported: ratio not 1ml/cm2 because with 3.7 ml sample not covered
2121	EN1811 + A1	2.43	R(0.01)	9.80	
2129	EN1811	0.77	C	-2.64	first reported: 0.653,
2131	In house	1.025		-0.73	
2132	EN1811	1.17		0.36	
2135	EN1811	1.0595		-0.47	
2139	EN1811	1.41		2.16	
2165	EN1811	1.087		-0.26	
2172	EN1811	1.085		-0.28	
2184	EN1811 + A1	1.156		0.25	
2201	EN1811 + AC	1.054		-0.51	
2213	EN1811	1.17		0.36	
2229	EN1811 + AC	1.24		0.88	
2232	EN1811	1.168		0.34	
2236	EN1811	1.293		1.28	
2238	EN1811 + AC	0.91		-1.59	
2246	EN1811	1.06		-0.47	
2247	EN1811	1.163		0.31	
2254	EN1811	0.8490		-2.05	
2255	EN1811	1.092		-0.23	
2256	EN1811 + AC	1.416		2.20	
2284	EN1811 + AC	1.047		-0.56	
2289	EN1811 + AC	1.095		-0.20	
2290	EN1811 + AC	0.91		-1.59	
2293	EN1811	1.40283126	C	2.10	first reported: 0.0014
2295	EN1811	0.9		-1.66	
2296	EN1811	0.574	ex	-4.11	ex: too low start volume of release solution (2 ml/ratio 0.5)
2300	EN1811	1.552	ex	3.22	ex: surface calculated incorrectly
2301	EN1811	1.2743		1.14	
2310	EN1811 + AC	1.312		1.42	
2311	EN1811 + AC	1.301		1.34	
2320	EN1811 + AC	1.358		1.77	
2347	EN1811	0.9721		-1.12	
2352	EN1811 + AC	1.056		-0.50	
2357	EN1811	0.89		-1.74	
2363	EN1811 + AC	1.149		0.20	
2365	EN1811	0.857		-1.99	
2366	EN1811 + AC	0.853		-2.02	
2369	EN1811 + AC	1.023	C	-0.74	first reported: 1022.62
2370	EN1811 + A1	1.04		-0.62	
2375	EN1811 + AC	1.24		0.88	
2377	EN1811 + AC	1.272	C	1.12	Ni-rel. avg.iis corr. due to correction other figure; reported: 1.366
2379	EN1811 + A1	1.215		0.70	
2380	EN1811	1.482		2.70	
2385	EN1811 + AC	1.467		2.58	
2390	EN1811	1.37	C	1.86	first reported: 4.07
2403	EN1811 + AC	1.054		-0.51	
2410	EN1811	0.92		-1.51	
2415	EN1811	0.98		-1.06	
2425	EN1811 + AC	1.248		0.94	
2429	EN1811	1.06		-0.47	
2432	EN1811 + AC	1.1149		-0.05	
2442	EN1811	1.1	C	-0.17	Ni-rel. avg.iis corr. due to correction other figure; reported: 1.3
2453		-----		-----	
2459	EN1811 + AC	1.081		-0.31	
2462		1.153		0.23	
2468	EN1811	2.34	R(0.01)	9.13	
2475	EN1811 + AC	1.501		2.84	
2489	EN1811	1.16		0.28	
2495	EN1811	1.663		4.05	
2496		0.80		-2.41	
2497	EN1811 + AC	0.946	C	-1.32	Ni-rel. avg.iis corr. due to correction other figure; reported: 0.641
2504	EN1811 + AC	1.217		0.71	
2508	EN1811 + AC	2.52	ex	10.48	ex: ratio 3.8

lab	method	value	mark	z(targ)	remarks
2511	EN1811	1.194		0.54	
2516	EN1811	1.353982		1.74	
2522	EN1811	144.9	R(0.01)	1077.40	
2538	EN1811	1.345		1.67	
2544	EN1811 + AC	1.02		-0.77	
2549	EN1811 + AC	1.04		-0.62	
2560	EN1811	1.483		2.70	
2563	EN1811	0.572	ex,C	-4.12	ex: ratio 3.75, first reported: 0.286
2567	EN1811	1.15		0.21	
2590	EN1811	0.464	ex,E	-4.93	ex: iis calculated: 4.64
2591	EN1811	1.3782		1.92	
2605	EN1811	0.644		-3.58	
2612	EN1811	0.807	C	-2.36	first reported: 326.0517
2624	EN1811	0.755		-2.75	
2629	EN1811	2.150191	R(0.01)	7.70	
2654	EN1811	1.367		1.84	
2657	EN1811	0.73		-2.94	
2668	EN1811	1.2023		0.60	
2674		1.167		0.34	
2701	EN1811 + AC	1.1908	C	0.51	Ni-rel. avg.iis corr. due to correction other figure; reported: 1.3428
2709	EN1811	1.064		-0.44	
2720	EN1811 + AC	1.172		0.37	
2737	EN1811 + AC	1.261		1.04	
2741	EN1811	1.214		0.69	
2744	EN1811 + AC	0.976		-1.09	
2754	EN1811 + AC	0.65	C	-3.54	Ni-rel. avg.iis corr. due to correction other figure; reported: 0.58
3100	EN1811 + AC	1.02		-0.77	
3110	EN1811 + AC	1.4497		2.45	
3116	EN1811	1.2747		1.14	
3118	EN1811	0.605		-3.87	
3124	EN1811 + AC	5.8	R(0.01)	35.05	
3146	EN1811 + AC	1.40		2.08	
3153	EN1811 + AC	1.28		1.18	
3154		1.405	ex	2.12	ex: ratio 13.0
3160	EN1811 + AC	<0.1		<-8.33	possible false negative test result
3172	EN1811	0.973		-1.12	
3176		1.092		-0.23	
3182	EN1811	1.006	C	-0.87	Ni-rel. avg.iis corr. due to correction other figure; first reported: 1.256
3185	EN1811 + AC	1.177		0.41	
3190	EN1811 + AC	1.0	C	-0.91	Ni-rel. avg.iis corr. due to correction other figure; first reported: 0.9
3197	EN1811 + AC	1.3019		1.35	
3200	EN1811 + AC	1.040		-0.62	
3209	EN1811 + AC	1.040		-0.62	
3210	EN1811 + AC	0.975		-1.10	
3218	EN1811 + AC	1.048		-0.56	
3220	EN1811	5.782	C,R(0.01)	34.92	first reported: 5782.1
3225	EN1811 + AC	1.262		1.05	
3228	EN1811 + AC	1.143		0.16	
3233	EN1811 + AC	0.9391		-1.37	
3237	EN1811	1.03		-0.69	
3248	EN1811	1.38		1.93	

normality	OK		
n	110		
outliers	8+6ex		
mean (n)	1.1221		
st.dev. (n)	0.20530	RSD=	18%
R(calc.)	0.5748		
R(EN1811:2011)	0.3737		

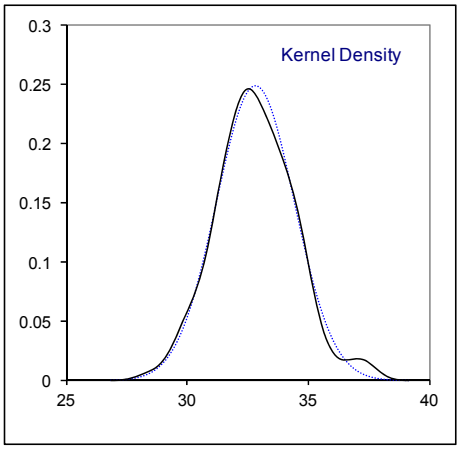


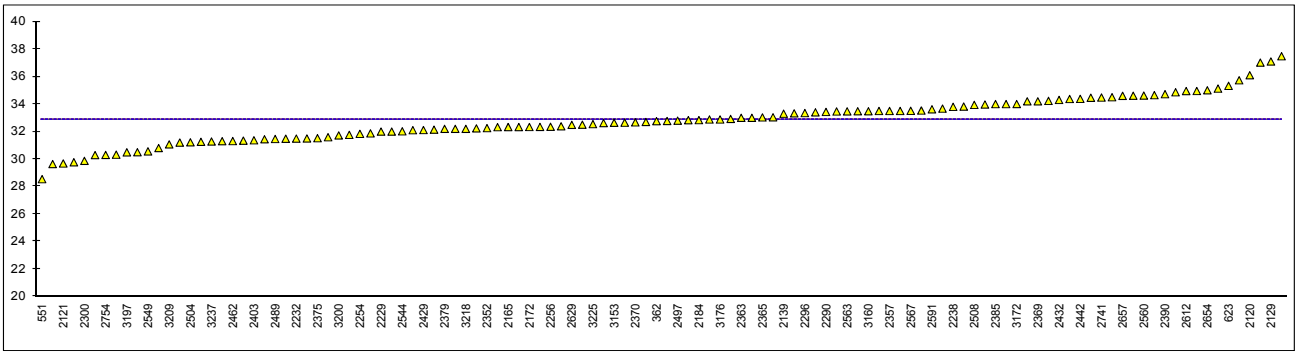


Determination of Surface determination on sample #16576; results in cm^2

lab	method	value	mark	z(targ)	remarks
110		30.8		-----	
213		34.95		-----	
310		31.34		-----	
339		-----		-----	
348		35.1265		-----	
362		32.76		-----	
551		28.54	C	-----	first reported: 25.57
623		35.328		-----	
840		-----		-----	
2102		31.25347		-----	
2115		-----		-----	
2120		36.10		-----	
2121		29.68		-----	
2129		37.10		-----	
2131		31.87		-----	
2132		34.2		-----	
2135		34.860	C	-----	first reported: 37.944
2139		33.3		-----	
2165		32.33		-----	
2172		32.331		-----	
2184		32.832		-----	
2201		32.92		-----	
2213		34.46		-----	
2229		32.00		-----	
2232		31.49		-----	
2236		29.768		-----	
2238		33.8		-----	
2246		34.5		-----	
2247		30.29		-----	
2254		31.834716		-----	
2255		32.234		-----	
2256		32.348		-----	
2284		33.48		-----	
2289		32.33		-----	
2290		33.43		-----	
2293		33.5		-----	
2295		32.34		-----	
2296		33.346		-----	
2300		29.87		-----	
2301		33.463		-----	
2310		32.65		-----	
2311		33.4		-----	
2320		33.67		-----	
2347		33.5304		-----	
2352		32.25		-----	
2357		33.5		-----	
2363		33		-----	
2365		33.030		-----	
2366		32.32		-----	
2369		34.2		-----	
2370		32.67		-----	
2375		31.52		-----	
2377		33.82		-----	
2379		32.199		-----	
2380		30.320		-----	
2385		34		-----	
2390		34.72		-----	
2403		31.3642		-----	
2410		32.5		-----	
2415		33.97		-----	
2425		34.65		-----	
2429		32.11		-----	
2432		34.3		-----	
2442		34.38		-----	
2453		-----		-----	
2462		31.31		-----	
2468		31.48		-----	
2475		30.5		-----	
2489		31.46		-----	
2495		31.59		-----	
2496		32.70		-----	
2497		32.7942		-----	
2504		31.22		-----	
2508		33.94	C	-----	first reported: 9.78
2511		34.0		-----	
2516		35.73127		-----	
2522		32.1		-----	

lab	method	value	mark	z(targ)	remarks
2538		37.48		-----	
2544		32.02		-----	
2549		30.56		-----	
2560		34.62		-----	
2563		33.47		-----	
2567		33.511		-----	
2590		34.23		-----	
2591		33.621		-----	
2605		32.77		-----	
2612		34.948		-----	
2624		32.14		-----	
2629		32.488		-----	
2654		35.003		-----	
2657		34.6		-----	
2668		32.880		-----	
2674		33.039		-----	
2701		33.3292		-----	
2709		31.76		-----	
2720		31.2		-----	
2737		32.62		-----	
2741		34.4772		-----	
2744		29.636		-----	
2754		30.299		-----	
3100		32.2		-----	
3110		32.3850		-----	
3116		31.44		-----	
3118		34.3699		-----	
3124		-----		-----	
3146		-----		-----	
3153		32.64		-----	
3154		34.61		-----	
3160		33.48		-----	
3172		34.0033		-----	
3176		32.88		-----	
3182		33	C	-----	first reported: 38.2
3185		33.5		-----	
3190		32		-----	
3197		30.49		-----	
3200		31.72		-----	
3209		31.07		-----	
3210		-----		-----	
3218		32.2		-----	
3220		31.5		-----	
3225		32.54		-----	
3228		32.83		-----	
3233		37.02	C	-----	first reported: 77.36
3237		31.28		-----	
3248		31.3		-----	
	normality	OK			
	n	118			
	outliers	0			
	mean (n)	32.832			
	st.dev. (n)	1.6042	RSD =	4.9%	
	R(calc.)	4.492			
	R(target)	n.a.			





APPENDIX 2

Determination of Nickel Release subsamples #16575-1, #16575-2, #16575-3; results in µg/cm^2/week

lab	method	#16575-1	mark	#16575-2	mark	#16575-3	mark	RSD$_r$ in %	replicates
110	EN1811	0.3703		0.4035		0.60275		27.4	3
213	EN1811 + AC	0.45		1.48		0.48		73.0	3
310	EN1811	2.107		1.704		1.420		19.8	3
339	EN1811 + AC	-----	W	1.30		1.275		-----	2
348	EN1811 + AC	1.263		1.821		0.921		34.0	3
362		-----		-----		-----		-----	1
551		1.79		0.86		0.36		72.3	3
623	EN1811 + A1	0.9007		0.8646		1.1896		18.1	3
840	EN1811	1.01		-----		-----		-----	1
2102	In house	1.6947		1.0705		1.0149		30.0	3
2115	EN1811	1.45		1.40		1.35		3.6	3
2120	EN1811 + AC	0.721		0.997		0.671		22.0	3
2121	EN1811 + A1	2.43		2.43		2.44		0.2	3
2129		-----	W	0.686		0.855		-----	2
2131	In house	0.84		1.21		-----		-----	2
2132	EN1811	0.96		1.29		1.26		15.6	3
2135	EN1811	1.1372		0.9817		1.0595		7.3	3
2139	EN1811	1.44		1.38		1.40		2.2	3
2165	EN1811	1.136		1.084		1.042		4.3	3
2172	EN1811	1.048		1.068		1.139		4.4	3
2184	EN1811 + A1	1.131		1.173		1.163		1.9	3
2201	EN1811 + AC	0.941		1.095		1.126		9.4	3
2213	EN1811	1.18		1.22		1.12		4.3	3
2229	EN1811 + AC	1.16		1.34		1.23		7.3	3
2232	EN1811	1.153		1.186		1.163		1.4	3
2236	EN1811	1.372		1.952		0.554		54.3	3
2238	EN1811 + AC	0.98		0.62		1.13		28.8	3
2246	EN1811	0.94		0.90		1.34		23.0	3
2247	EN1811	1.136		1.216		1.132		4.1	3
2254	EN1811	1.0905		1.085399		0.371113757		48.7	3
2255	EN1811	0.736		1.639		0.901		44.0	3
2256	EN1811 + AC	1.426		1.437		1.385		1.9	3
2284	EN1811 + AC	1.083		0.935		1.124		9.5	3
2289	EN1811 + AC	1.038		1.057		1.193		7.7	3
2290	EN1811 + AC	0.89		0.92		0.93		2.3	3
2293	EN1811	0.6822058	C	0.975668	C	2.55061916	C	71.6	3
2295	EN1811 + AC	0.83		0.76		1.2		25.4	3
2296	EN1811	0.444		0.755		0.523		28.2	3
2300	EN1811	1.556		1.598		1.503		3.1	3
2301	EN1811	1.4868		1.1982		1.1380		14.6	3
2310	EN1811 + AC	1.269		1.321		1.351		3.2	3
2311	EN1811 + AC	1.253		1.361		1.289		4.2	3
2320	EN1811 + AC	1.203		1.330		1.541		12.6	3
2347	EN1811	0.8329		1.2588		0.8245		25.5	3
2352	EN1811 + AC	0.9059		1.0421		1.2194		14.9	3
2357	EN1811	0.78		0.88		1.0		12.4	3
2363	EN1811 + AC	1.093		-----	W	1.205		-----	2
2365	EN1811	0.366		0.679		1.526		70.0	3
2366	EN1811 + AC	0.67		0.99		0.90		19.3	3
2369	EN1811 + AC	0.890	C	0.963	C	1.215	C	16.7	3
2370	EN1811 + A1	0.938		1.03		1.14		9.8	3
2375	EN1811 + AC	1.22		1.24		1.26		1.6	3
2377	EN1811 + AC	1.200		1.52	C	1.097		17.3	3
2379	EN1811 + A1	1.277		0.796		1.573		32.3	3
2380	EN1811	1.618		1.383		1.445		8.2	3
2385	EN1811 + AC	1.595		0.881		1.924		36.4	3
2390	EN1811	1.12	C	1.13	C	1.86	C	31.0	3
2403	EN1811 + AC	1.058		1.061		1.043		0.9	3
2410	EN1811	1.0		0.55		1.2		36.3	3
2415	EN1811	1.48		0.947		0.51		49.6	3
2425	EN1811 + AC	1.301		1.27		1.173		5.4	3
2429	EN1811	1.10		0.99		1.09		5.7	3
2432	EN1811 + AC	1.18967		1.13647		1.01856		7.9	3
2442	EN1811	0.83		1.06		1.43	C	27.4	3
2453		-----		-----		-----		-----	0
2459	EN1811 + AC	1.211		0.972		1.061		11.2	3
2462	EN1811 + AC	1.153		-----		-----		-----	1
2468	EN1811	2.16		1.83		3.04		26.7	3
2475	EN1811 + AC	1.547		2.174		0.781		46.5	3
2489	EN1811	1.13		1.16		1.16		1.5	3
2495	EN1811	1.563		2.295		1.130		35.4	3
2496	EN1811 + A1	0.85		0.54		1.02		30.3	3
2497	EN1811 + AC	1.031		0.964	C	0.844	C	10.0	3
2504	EN1811 + AC	1.112		1.414		1.126		14.0	3

lab	method	#16575-1	mark	#16575-2	mark	#16575-3	mark	RSD$_r$ in %	replicates
2508	EN1811 + AC	1.65		2.63		3.27		32.4	3
2511	EN1811	1.161		1.190		1.231		2.9	3
2516	EN1811	1.258587		1.479110		1.324248		8.4	3
2522	EN1811	137.1		137.5		159.9		9.0	3
2538	EN1811	1.26		1.43		-----	W	-----	2
2544	EN1811 + AC	1.09		0.959		1.02		6.4	3
2549	EN1811 + AC	0.98		0.99		1.15		9.2	3
2560	EN1811	1.66		1.34		1.45		11.0	3
2563	EN1811	0.564	C	0.58	C	-----		-----	2
2567	EN1811	1.16		0.98		1.30		14.0	3
2590	EN1811	0.461		0.472		0.460		1.4	3
2591	EN1811	1.3598		1.3966		-----		-----	2
2605	EN1811	0.727		0.610		0.594		11.3	3
2612	EN1811	1.306		0.430		0.686		55.8	3
2624	EN1811	0.666		0.946		0.653		21.9	3
2629	EN1811	2.141937		2.265749		2.042888		5.2	3
2654	EN1811	1.614		0.973		1.516		25.2	3
2657	EN1811	0.63		0.76		0.81		12.7	3
2668	EN1811	1.1888		1.2068		1.2113		1.0	3
2674	EN1811 + AC	1.167		-----		-----		-----	1
2701	EN1811 + AC	1.4834	C	1.2725		0.8164		28.6	3
2709	EN1811	0.835		1.073		1.286		21.2	3
2720	EN1811 + AC	1.362		1.051		1.103		14.2	3
2737	EN1811 + AC	1.159		1.283		1.341		7.4	3
2741	EN1811	0.997		1.35		1.295		15.6	3
2744	EN1811 + AC	0.977		1.020		0.929		4.7	3
2754	EN1811 + AC	0.62		0.68	C	0.64		4.7	3
3100	EN1811 + AC	1.06		0.89		1.10		11.0	3
3110	EN1811 + AC	1.2109		2.1381		1.0000		41.8	3
3116	EN1811	1.2731		1.2059		1.3462		5.5	3
3118	EN1811	0.674		0.586		0.553		10.4	3
3124	EN1811 + AC	5.808		2.463		9.07		57.2	3
3146	EN1811 + AC	2.29	C	1.11		0.75		58.2	3
3153	EN1811 + AC	1.24		1.39		1.21		7.5	3
3154	EN1811	1.426	C	1.306		1.482		6.4	3
3160	EN1811 + AC	0.01		0.02		0.03		50.0	3
3172	EN1811	0.92		1.13		0.87		14.2	3
3176	EN1811	1.092		-----		-----		-----	1
3182	EN1811	0.546		1.059	C	1.414		43.4	3
3185	EN1811 + AC	1.020		1.260		1.250		11.5	3
3190	EN1811 + AC	1.2		0.9		0.8	C	21.5	3
3197	EN1811 + AC	1.6854		0.9073		1.3131		29.9	3
3200	EN1811 + AC	0.920		1.00		1.20		13.9	3
3209	EN1811 + AC	0.900		1.180		1.040		13.5	3
3210	EN1811 + AC	0.869		1.08		-----		-----	2
3218	EN1811 + AC	0.951		1.146		1.046		9.3	3
3220	EN1811	6.667	C	5.827	C	4.950	C	14.8	3
3225	EN1811 + AC	0.9698		1.1939		1.6217		26.2	3
3228	EN1811 + AC	1.143		1.200		1.087		4.9	3
3233	EN1811 + AC	0.9716		1.1357		0.7100		22.9	3
3237	EN1811	0.90		0.82		1.38		29.3	3
3248	EN1811	1.38		1.38		1.38		0.0	3

Lab 339 first reported 2.305 for sample #16575-1
Lab 2129 first reported 0.418 for sample #16575-1
Lab 2293 first reported: 0.00068; 0.00098, 0.002545 for Ni-release respectively
Lab 2363 reported: 0.571 for sample #16575-2 but did not use this to calc. the avg Ni release
Lab 2369 first reported: 889.79, 962.78 and 1215.28 for Ni-release respectively
Lab 2377 first reported 1.82 for sample #16575-2
Lab 2390 first reported: 2.38, 3.37 and 6.47 for Ni-release respectively
Lab 2442 first reported 1.83 for sample #16575-3
Lab 2497 first reported 0.482 and 0.422 for samples #16575-2 and #16575-3
Lab 2538 first reported 2.44 for sample #16575-3
Lab 2563 first reported 0.282 and 0.29 for samples #16575-1 and #16575-2
Lab 2701 first reported 1.9396 for sample #16575-1
Lab 2754 first reported 0.47 for sample #16575-2
Lab 3146 first reported 2.33 for sample #16575-1
Lab 3154 first reported 14.26 for sample #16575-1
Lab 3182 first reported 1.807 for sample #16575-2
Lab 3190 first reported 0.4 for sample #16575-3
Lab 3220 first reported: 6667.7, 5827.2 and 4950.14 for Ni-release respectively

n	112
mean (n)	19.4%
st.dev. (n)	17.7%

APPENDIX 3

Reported pH release solution and reported vs calculated ratios for sample #16575

lab	method	pH	pH adjusted with	Ratio reported in ml/cm^2	Ratio calc by iis in ml/cm^2	remarks
110	EN1811	6.5		1	1	
213	EN1811 + AC	6.5		1	1	
310	EN1811	6.5		1	1	
339	EN1811 + AC	6.53		1	1	
348	EN1811 + AC	6.51		1.25	1.25	
362		6.5		1	1	
551		6.5		1	-----	
623	EN1811 + A1	6.5		1	1	
840	EN1811	6.5		1	1	
2102	In house	6.5		1	1	
2115	EN1811	6.5		1	1	
2120	EN1811 + AC	6.5	NaOH	1.62	1.62	
2121	EN1811 + A1	6.54		1	1	
2129		6.5		1	1	
2131	In house	-----		1	1	
2132	EN1811	6.49		1.22	1.22	
2135	EN1811	6.5		1	1.7	iis calculated a different ratio
2139	EN1811	6.46	NaOH	1.02	1.02	
2165	EN1811	6.48		1.01	1.01	
2172	EN1811	6.5		1	1	
2184	EN1811 + A1	6.52		1	1	
2201	EN1811 + AC	6.5		1	1	
2213	EN1811	6.48		1	1	
2229	EN1811 + AC	6.47		0.14	2	iis calculated a different ratio
2232	EN1811	6.5		1.25	0.88	probably reported ratio in cm^2/ml?
2236	EN1811	6.5		1.0	1.0	
2238	EN1811 + AC	6.51	NaOH	1	1	
2246	EN1811	6.5		1.22	1.22	
2247	EN1811	6.5		1	1	
2254	EN1811	-----	NaOH	1	1	
2255	EN1811	6.5		0.8	1.25	probably reported ratio in cm^2/ml?
2256	EN1811 + AC	6.52		2	2	
2284	EN1811 + AC	6.51		1	1	
2289	EN1811 + AC	6.5		1	1	
2290	EN1811 + AC	-----		-----	1.0	
2293	EN1811	6.5	**NH4OH**	1	1	
2295	EN1811 + AC	6.5		1.28	1.28	
2296	EN1811	6.5		-----	0.5	
2300	EN1811	6.5		1	1	
2301	EN1811	6.5		10	1.3	iis calculated a different ratio
2310	EN1811 + AC	6.5		1	1	
2311	EN1811 + AC	6.5		1	1	
2320	EN1811 + AC	6.5		1	1	
2347	EN1811	6.54		1	1	
2352	EN1811 + AC	6.51		1	1	
2357	EN1811	6.5		1	1	
2363	EN1811 + AC	5.5		1	1	
2365	EN1811	6.5		1	1	
2366	EN1811 + AC	6.5		1	1	
2369	EN1811 + AC	-----		-----	1.0	
2370	EN1811 + A1	6.53		1	1	
2375	EN1811 + AC	6.5		1	1	
2377	EN1811 + AC	6.51	NaOH	1.25	1.25	
2379	EN1811 + A1	-----		-----	1.0	
2380	EN1811	6.5		1	1	
2385	EN1811 + AC	6.5		1	1	
2390	EN1811	6.5		1	1	
2403	EN1811 + AC	6.52	NaOH	1	1	
2410	EN1811	6.51		1	1	
2415	EN1811	6.51		1	1	
2425	EN1811 + AC	6.5		1	1	
2429	EN1811	6.55	NaOH	1	1	
2432	EN1811 + AC	6.5		-----	1.3	
2442	EN1811	6.49		1	1	
2453		-----		-----	-----	
2459	EN1811 + AC	6.5	NaOH	1	1	
2462	EN1811 + AC	6.54		1	1	
2468	EN1811	6.5		1	1	
2475	EN1811 + AC	6.5	NaOH	1	1	
2489	EN1811	6.5		3.8	1	iis calculated a different ratio
2495	EN1811	6.51	NaOH	1	1	
2496	EN1811 + A1	6.52		1	1	

lab	method	pH	pH adjusted with	Ratio reported in ml/cm^2	Ratio calc by iis in ml/cm^2	remarks
2497	EN1811 + AC	6.48		1	1	
2504	EN1811 + AC	6.5	NaOH	1	1	
2508	EN1811 + AC	6.53		3.8	3.8	
2511	EN1811	6.52		1.25	1.25	
2516	EN1811	6.47		1	1	
2522	EN1811	6.5	NaOH	1	1	
2538	EN1811	6.5	NaOH	0.9	0.9	
2544	EN1811 + AC	6.5	NaOH	1	1	
2549	EN1811 + AC	6.51		1.01	1.01	
2560	EN1811	6.5		1	1	
2563	EN1811	6.49		3.75	3.75	
2567	EN1811	6.5	NaOH	1	1	
2590	EN1811	6.5		2.55	2.55	
2591	EN1811	6.5		1	1.5	iis calculated a different ratio
2605	EN1811	6.53		1	1	
2612	EN1811	6.5		2.5	2.5	
2624	EN1811	6.5	NaOH	1	1	
2629	EN1811	6.51		1	1	
2654	EN1811	6.5		1	1	
2657	EN1811	6.5		-----	1.3	
2668	EN1811	6.5	NaOH	5	1.3	iis calculated a different ratio
2674	EN1811 + AC	6.5	NaOH	1	1	
2701	EN1811 + AC	6.48		1	1	
2709	EN1811	6.48	**NH4OH**	1	1	
2720	EN1811 + AC	6.48		1	1	
2737	EN1811 + AC	6.48	NaOH	1	1	
2741	EN1811	6.51		1	1	
2744	EN1811 + AC	6.5		1.29	1.29	
2754	EN1811 + AC	6.52		1	1	
3100	EN1811 + AC	6.51		1	1	
3110	EN1811 + AC	6.5		1	1	
3116	EN1811	6.5		1.025	1.025	
3118	EN1811	6.5		1.24	1.24	
3124	EN1811 + AC	6.5		1	1	
3146	EN1811 + AC	6.4		1	1	
3153	EN1811 + AC	6.52	NaOH	1	1	
3154	EN1811	-----		-----	13.0	
3160	EN1811 + AC	6.52	NaOH	2.5	2.5	
3172	EN1811	6.53		1	1	
3176	EN1811	6.5		-----	1.0	
3182	EN1811	6.5		1	1	
3185	EN1811 + AC	6.5	NaOH	1	1	
3190	EN1811 + AC	6.5	**NH4OH**	1	1	
3197	EN1811 + AC	6.49		1	1	
3200	EN1811 + AC	6.5		1	1	
3209	EN1811 + AC	6.5		1	1	
3210	EN1811 + AC	-----		2.5	2.5	
3218	EN1811 + AC	6.5		1	1	
3220	EN1811	6.5	**NH4OH**	3	3	
3225	EN1811 + AC	6.51		1	1	
3228	EN1811 + AC	6.5		1	1	
3233	EN1811 + AC	6.47		1	1	
3237	EN1811	6.51		2.02	2.02	
3248	EN1811	6.5	**NH4OH**	1	1	

APPENDIX 4

Reported analytical details for sample #16575-1:

lab	Volume start solution (ml)		days sample soaked	Sample surface used (cm^2)		final volume (after dilution) (ml)		measured Ni-conc. in end solution (µg/l)	
110	4		7	3.99		5		0.2955	
213	4.00		7	4.08		10		183.110	
310	4		7	3.99		10		842.700	
339	3.9	C	7	3.89		10	C	2299.807	
348	5		7	3.99		10		504.325	
362	-----		-----	-----		-----		-----	
551	-----		-----	3.90		-----		-----	
623	3.8		7	3.817		10		345.0	
840	4		7	3.94		10		394	
2102	3.9543		7	3.9543		39.50		169.654	
2115	3.85		7	3.85		10.0		556.81	
2120	6		7	3.704		10		267.0	
2121	4		7	3.99		15		64.539	
2129	3.90	C	7	3.90		14		-----	W
2131	3.9		7	3.9		5.0		650	
2132	5		7	4.1		10		391.9	
2135	3.9		7	3.67		25		4.1735	
2139	4		7	3.9		5		1120	
2165	4.00		7	3.961		20.00		0.225	
2172	4		7	3.99		5		0.8365	
2184	4.0		7	3.98		10		0.455	
2201	4.0		7.0	4.0		25.0		150.5	
2213	4		7	3.98		10		469	
2229	8	C	7	4.07		50		94.5	
2232	3.5		7	3.994		5		0.9213	
2236	4.00		7	3.99		25		218.82	
2238	3.9		7	3.9		25		152.8	
2246	5		7	4.1		10		387	
2247	4.0		7	4.0		10		0.458	
2254	4		7	3.78		10		0.41222	
2255	5		7	4.03		10		0.2969	
2256	8		7	3.983		10		568	
2284	4.00		7	3.996		5.00		0.866	
2289	4.0		7	4.0		10		415	
2290	4.03		7	4.03		50		71.7	
2293	4		7	3.9577		10		0.273	
2295	5		7	3.91		10		324.587	
2296	2.0		7	4.058		20.0		0.092	
2300	3		7	2.997	R(0.01)	5		932.67	
2301	5	C	7	3.971		25		0.2361	
2310	5		7	3.9		10		495	
2311	4		7	4.151		50		0.104	
2320	3.90		7	3.90		5.0		938.25	
2347	3.97		7	3.974		10		330.681	
2352	4		7	3.92		10		355.1	
2357	4		7	3.97		10		310	
2363	4		7	3.96		10		433	
2365	3.983		7	3.983		25		58.27	
2366	4.0		7	3.96		5		0.53	
2369	4		7	3.95		25		140.59	
2370	4		7	3.938		10		0.370	
2375	3.96		7	3.96		10		483.4	
2377	5		7	4.01		10		486	
2379	3.90		7	3.90		5		996.00	
2380	4.0		7	3.796		10.0		614.140	
2385	4		7	3.98		4.0625		1563	
2390	3.96		7	3.96		10		236	
2403	3.90		7	3.90		10.0		412.785	
2410	4		7	4.0		10		401.4	
2415	4		7	3.97		5		1.17	
2425	4		7	3.96		10		515.41	
2429	3.90		7	3.87		10		0.429	
2432	5		7	3.97		10		472.30	
2442	4		7	3.67		10		304.573	
2453	-----		-----	-----		-----		-----	
2459	4.0		7	3.952		4.0		1211	
2462	4		7	3.999		20		230.61	
2468	3.9		7	3.93		10		0.844	
2475	4.02		7	4.01		10		622.073	
2489	3.8		7	3.8		10		42.79	
2495	4.00		7	3.9785		5.00		1.244	
2496	4.1		7	4.06		5.0		0.688	

lab	Volume start solution (ml)		days sample soaked	Sample surface used (cm^2)		final volume (after dilution) (ml)		measured Ni-conc. in end solution (µg/l)	
2497	5		7	4.0377		25		167	
2504	4.10		7	4.0833		10.0		454.008	
2508	15		7	3.96		15.3		427.5	
2511	5.0		7.0	3.99		50.0		92.687	
2516	3.9028		7	3.9028		10		0.490849000	
2522	4.0		7.0	3.8		25.0		20.8	
2538	3.5		7	4.023		10		0.508	
2544	3.99		7	3.99		10		433.0	
2549	4		7	3.95		10		386.65	
2560	4.0		7.0	3.73		25.0		248.0	
2563	15		7	3.997		20		56.28	
2567	5.0		7	4.035		10		469.4	
2590	10.00		7	3.92		100.00		182.78	
2591	6.01		7	4.01		10.0		0.5453	
2605	4.00		7.0	4.04		10.0		0.294	
2612	10		7	4.038		50.0	C	105.509	C
2624	4		7	4.06		10		270.3	
2629	5.0		7	4.0384		5.0		1730	
2654	3.72		7	3.72		10		600.30	
2657	5		7	3.8		10		240	
2668	5.0		7.0	3.76		50		0.08939	
2674	4.00		7	4.0599		20.00		237.17	
2701	4		7	3.9461		5		1170.7	C
2709	4.00		7	3.98		10		332	
2720	4.0		7	3.99		10		543.5	
2737	4		7	4.0331		10		467.452	
2741	3.75		7	3.75		5		149.612	
2744	5.00		7	3.858		100.00		37.729	
2754	4		7	3.81		10		237.7	
3100	4.0		7	4.0		10		0.424	
3110	5		7	4.0002		10		484.4	
3116	4.00		7	3.90		5.00		993	
3118	5		7	4.019		10		271	
3124	3.84		7	3.84		3.84		5808	
3146	4.00		7	3.96		10		923	
3153	3.9		7	3.985		10		495	
3154	50		7	3.84		50		54.79	
3160	10		7	3.96		20		< 25	
3172	4		7	3.993		200		18.064	
3176	4	C	7	3.89		25		174.24	
3182	4.00		7	4.01		10.00		218.85	
3185	4.0		7.0	4.0		10.0		408.1	
3190	4.0		7	4.0		25		0.19	
3197	4		7	3.98		10		0.6708	
3200	3.980		7	3.980		10		366.16	
3209	4.00		7	4.00		8.00		450	
3210	10		7	3.90		10		339	
3218	3.9		7	3.9		10		370.9	
3220	10		7	3.43	R(0.01)	**9**		9148.12	
3225	4.0		7.0	3.99		10		0.3838	
3228	3.98		7	3.98		25		182	
3233	4		7	3.99		5		775.3	
3237	8		7	3.96		10		35.463	
3248	4.04		7	4.04		5		1.115	
			normality	suspect					
			n	122					
			outliers	2					
			mean (n)	3.950					
			st.dev (n)	0.0901	RSD=2.3%				

Lab 339 first reported 500 ml for volume start solution and 3.9 ml for final volume (after dilution)
Lab 2129 first reported 7 ml for volume start solution and 233 for Ni conc.
Lab 2229 first reported 28 ml for volume start solution
Lab 2301 first reported 10 ml for volume start solution
Lab 2612 first reported 9.8 ml for volume final volume (after dilution) and 527.544 for Ni-conc
Lab 2701 first reported 1530.8 for Ni-conc
Lab 3176 first reported 8 ml for volume start solution

Reported analytical details for sample #16575-2:

lab	Volume start solution (ml)		days sample soaked	Sample surface used (cm^2)		final volume (after dilution) (ml)		measured Ni-conc. in end solution (µg/l)
110	4		7	3.99		5		0.322
213	4.00		7	4.08		10		604.4
310	4		7	3.99		10		681.700
339	3.9	C	7	3.89		10	C	1296.659
348	5		7	3.97		10		723.375
362	-----		-----	-----		-----		-----
551	-----		-----	3.90		-----		-----
623	3.7		7	3.747		10		325.1
840	-----		-----	-----		-----		-----
2102	3.9544		7	3.9544		39.50		107.165
2115	3.85		7	3.85		10.0		540.50
2120	6		7	3.737		10		372.6
2121	4		7	3.99		15		64.630
2129	3.90	C	7	3.90		14		382
2131	3.9		7	3.9		5		940
2132	5		7	4.1		10		527.0
2135	10		7	3.67		25		3.603
2139	4		7	3.9		5		1074
2165	4.00		7	3.961		20.00		0.215
2172	4		7	3.99		5		0.8521
2184	4.0		7	3.98		10		0.472
2201	4.0		7.0	4.0		25.0		175.2
2213	4		7	3.98		10		486
2229	8	C	7	4.07		50		108.5
2232	3.5		7	3.981		5		0.944
2236	4.00		7	3.97		25		309.79
2238	3.9		7	3.9		25		96.8
2246	5		7	4.1		10		369.6
2247	4.0		7	4		10		0.4877
2254	4		7	3.78		10		0.410281
2255	5		7	4.03		10		0.6605
2256	8		7	3.972		10		571
2284	4.00		7	3.996		5.00		0.748
2289	4.0		7	4.0		10		423
2290	4.03		7	4.03		100		37.08
2293	4		7	3.9972		10		0.393
2295	5		7	3.91		10		296.705
2296	2.0		7	4.028		20.0		0.152
2300	3		7	2.997	R(0.01)	5		957.97
2301	5	C	7	3.963		25		0.1898
2310	5		7	3.9		10		515
2311	4		7	4.151		50		0.113
2320	3.90		7	3.90		5.0		1037.36
2347	3.97		7	3.974		10		499.745
2352	4		7	3.92		10		408.5
2357	4		7	3.97		10		360
2363	4		7	3.96		10		**226**
2365	3.983		7	3.983		25		108.14
2366	4.0		7	3.96		5		0.78
2369	4		7	3.95		25		152.12
2370	4		7	3.930		10		0.405
2375	3.96		7	3.96		10		490.4
2377	5		7	4.01		10		735
2379	3.90		7	3.90		5		621
2380	4.0		7	3.796		10.0		525.300
2385	4		7	3.98		4.0625		863
2390	3.96		7	3.96		10		267
2403	3.90		7	3.90		10.0		413.605
2410	4		7	4.0		10		219.4
2415	4		7	3.97		5		0.72
2425	4		7	3.96		10		501.71
2429	3.90		7	3.87		10		0.386
2432	5		7	3.97		10		451.18
2442	4		7	3.67		10		390.455
2453	-----		-----	-----		-----		-----
2459	4.0		7	3.952		4.0		972
2462	-----		-----	-----		-----		-----
2468	3.9		7	3.93		10		0.714
2475	4.02		7	4.01		10		871.834
2489	3.8		7	3.8		10		44.19
2495	4.00		7	3.9785		5.00		1.826
2496	4.1		7	4.06		5.0		0.435
2497	5		7	4.0377		25		77
2504	4.10		7	4.0551		10.0		577.382

lab	Volume start solution (ml)	days sample soaked	Sample surface used (cm^2)	final volume (after dilution) (ml)		measured Ni-conc. in end solution (µg/l)	
2508	15	7	3.96	15.3		681.5	
2511	5.0	7.0	3.99	50.0		94.978	
2516	3.9028	7	3.9028	10		0.576853000	
2522	4.0	7.0	3.8	25.0		20.9	
2538	3.5	7	4.013	10		574	
2544	3.99	7	3.99	10		382.5	
2549	4	7	3.95	10		393.85	
2560	4.0	7.0	3.73	25.0		200.0	
2563	15	7	3.974	20		57.38	
2567	5.0	7	4.035	10		395.4	
2590	10	7	3.92	100		-----	
2591	6.01	7	4.01	10.0		0.5601	
2605	4.00	7.0	4.04	10.0		0.246	
2612	10	7	4.043	50.0	C	34.766	C
2624	4	7	4.06	10		383.9	
2629	5.0	7	4.0384	5.0		1810	
2654	3.78	7	3.78	10		367.8	
2657	5	7	3.8	10		290	
2668	5.0	7.0	3.76	50.0		0.09075	
2674	-----	-----	-----	-----		-----	
2701	4	7	3.9521	5		1005.8	
2709	4.00	7	3.98	10		427.5	
2720	4.0	7	3.99	10.0		419.5	
2737	4	7	4.0331	10		517.491	
2741	3.77	7	3.77	5		101.831	
2744	5.00	7	3.858	100.00		39.372	
2754	4	7	3.81	10		257.7	C
3100	4.0	7	4.0	10		0.356	
3110	5	7	4.0002	10		855.3	
3116	4.00	7	3.91	5.00		943	
3118	5	7	4.036	10		237	
3124	3.84	7	3.84	3.84		2463	
3146	4	7	3.96	10		439	
3153	3.9	7	3.956	10		551	
3154	50	7	3.84	50		5.018	
3160	10	7	3.96	20		< 25	
3172	4	7	3.993	200		22.530	
3176	-----	-----	-----	-----		-----	
3182	4.00	7	4.01	10.00		724.70	
3185	4.0	7.0	4.0	10.0		503.2	
3190	4.0	7	4.0	25		0.15	
3197	4	7	3.98	10		0.3611	
3200	3.981	7	3.981	10		398.25	
3209	4.00	7	4.00	8.00		590	
3210	10	7	3.90	10		421	
3218	3.9	7	3.9	10		447.3	
3220	10	7	3.84	**9**		8950.61	
3225	4.0	7	3.99	10		0.4732	
3228	3.98	7	3.98	25		191	
3233	4	7	3.99	5		906.3	
3237	8	7	3.96	10		32.448	
3248	4.04	7	4.04	5		1.115	

normality	suspect	
n	119	
outliers	1	
mean (n)	3.948	
st.dev (n)	0.0891	RSD=2.3%

Lab 339 first reported 500ml for volume start solution and 3.9 ml for final volume (after dilution)
Lab 2129 first reported 7 for volume start solution
Lab 2229 first reported 28ml for volume start solution
Lab 2301 first reported 10 ml for volume start solution
Lab 2612 first reported 9.8 ml for volume final volume (after dilution) and 173.831 for Ni-conc
Lab 2754 first reported 237.7 for Ni-conc

Reported analytical details for sample #16575-3:

lab	Volume start solution (ml)		days sample soaked	Sample surface used (cm^2)		final volume (after dilution) (ml)		measured Ni-conc. in end solution (µg/l)
110	4		7	3.99		5		0.481
213	4.00		7.0	4.08		10.0		194.55
310	4		7	3.99		10		567.900
339	3.9	C	7	3.91		10	C	1280.465
348	5		7	3.98		10		367.225
362	-----		-----	-----		-----		-----
551	-----		-----	3.90		-----		-----
623	3.7		7	3.736		10		445.6
840	-----		-----	-----		-----		-----
2102	3.95		7	3.9407		39.50		101.247
2115	3.85		7	3.85		10.0		519.75
2120	6		7	3.714		10		284.2
2121	4		7	3.99		15		64.798
2129	3.90	C	7	3.90		14		476
2131	-----		-----	-----		-----		-----
2132	5		7	4.1		10		514.7
2135	5		7	3.67		25		3.8825
2139	4		7	3.9		5		1090
2165	4.00		7	3.961		20.00		0.206
2172	4		7	3.99		5		0.9091
2184	4.0		7	3.98		10		0.468
2201	4.0		7.0	4.0		25.0		180.2
2213	4		7	3.98		10		446
2229	8	C	7	4.07		50		100
2232	3.5		7	3.977		5		0.925
2236	4.00		7	3.97		25		88.48
2238	3.9		7	3.9		25		176.3
2246	5		7	4.1		10		550.2
2247	4		7	4		10		0.4543
2254	4		7	3.78		10		0.140227
2255	5		7	4.03		10		0.3633
2256	8		7	3.965		10		549
2284	4.00		7	3.996		5.00		0.899
2289	4.0		7	4.0		10		477
2290	4.03		7	4.03		100		37.3
2293	4		7	3.9990		10		1.018
2295	5		7	3.91		10		469.933
2296	2.0		7	4.045		20.0		0.106
2300	3		7	2.997	R(0.01)	5		900.924
2301	5	C	7	3.962		25		0.1803
2310	5		7	3.9		10		527
2311	4		7	4.151		50		0.107
2320	3.90		7	3.90		5.0		1201.67
2347	3.97		7	3.974		10		327.307
2352	4		7	3.92		10		478.0
2357	4		7	3.97		10		420
2363	4		7	3.96		10		477
2365	3.983		7	3.983		25		242.96
2366	4.0		7	3.96		5		0.71
2369	4		7	3.95		25		192.01
2370	4		7	3.942		10		0.450
2375	3.96		7	3.96		10		499
2377	5		7	4.01		10		445
2379	3.90		7	3.90		5		1227
2380	4.0		7	3.796		10.0		548.435
2385	4		7	3.98		4.0625		1885
2390	3.96		7	3.96		10		256.5
2403	3.90		7	3.90		10.0		406.835
2410	4		7	4		10		482.2
2415	4		7	3.97		5		0.745
2425	4		7	3.93		10		461.03
2429	3.90		7	3.87		10		0.426
2432	5		7	3.97		10		404.37
2442	4		7	3.67		10		670.338
2453	-----		-----	-----		-----		-----
2459	4.0		7	3.952		4.0		1061
2462	-----		-----	-----		-----		-----
2468	3.9		7	3.93		10		1.18
2475	4.02		7	4.01		10		313.303
2489	3.8		7	3.8		10		44.19
2495	4.00		7	3.9785		5.00		0.899
2496	4.1		7	4.06		5.0		0.830
2497	5		7	4.0377		25		68
2504	4.10		7	4.0301		10.0		459.617

lab	Volume start solution (ml)	days sample soaked	Sample surface used (cm^2)	final volume (after dilution) (ml)		measured Ni-conc. in end solution (µg/l)	
2508	15	7	3.96	15.3		846.5	
2511	5.0	7.0	3.99	50.0		98.287	
2516	3.9028	7	3.9028	10		0.516457000	
2522	4.0	7.0	3.8	25.0		24.3	
2538	3.5	7	3.997	10		976	
2544	3.99	7	3.99	10		406.3	
2549	4	7	3.95	10		455.12	
2560	4.0	7.0	3.73	25.0		216.0	
2563	-----	-----	-----	-----		-----	
2567	5.0	7	4.035	10		524.5	
2590	10	7	3.92	100		-----	
2591	-----	-----	-----	-----		-----	
2605	4.00	7.0	4.04	10.0		0.240	
2612	10	7	4.033	50.0	C	55.356	C
2624	4	7	4.06	10		265.0	
2629	5.0	7	4.0384	5.0		1650	
2654	3.77	7	3.77	10		571.4	
2657	5	7	3.8	10		310	
2668	5.0	7.0	3.76	50.0		0.09109	
2674	-----	-----	-----	-----		-----	
2701	4	7	3.9520	5		645.3	
2709	4.00	7	3.98	10		512	
2720	4.0	7	3.99	10.0		440.3	
2737	4	7	4.0331	10		540.769	
2741	3.77	7	3.77	5		195.271	
2744	5.00	7	3.858	100.00		35.868	
2754	4	7	3.81	10		243.9	
3100	4.0	7	4.0	10		0.440	
3110	5	7	4.0002	10		400.0	
3116	4.00	7	3.90	5.00		1050	
3118	5	7	4.031	10		223	
3124	3.84	7	3.84	3.84		9070	
3146	4	7	3.96	10		296	
3153	3.9	7	3.984	10		483	
3154	50	7	3.84	50		5.694	
3160	10	7	3.96	20		< 25	
3172	4	7	3.993	200		17.304	
3176	-----	-----	-----	-----		-----	
3182	4.00	7	4.01	10.00		567.20	
3185	4.0	7.0	4.0	10.0		498.3	
3190	4.0	7	4.0	25		0.07	
3197	4	7	3.98	10		0.5226	
3200	3.981	7	3.981	10		477.62	
3209	4.00	7	4.00	8.00		520	
3210	-----	-----	-----	-----		-----	
3218	3.9	7	3.9	10		407.9	
3220	10	7	3.86	**9**		7643.02	
3225	4.0	7	3.99	10		0.6439	
3228	3.98	7	3.98	25		173	
3233	4	7	3.99	5		566.6	
3237	8	7	3.96	10		54.584	
3248	4.04	7	4.04	5		1.115	

normality	suspect	
n	115	
outliers	1	
mean (n)	3.948	
st.dev (n)	0.0906	RSD=2.3%

Lab 339 first reported 500ml for volume start solution and 3.9 ml for final volume (after dilution)
Lab 2129 first reported 7 for volume start solution
Lab 2229 first reported 28ml for volume start solution
Lab 2301 first reported 10 ml for volume start solution
Lab 2612 first reported 9.8 ml for volume final volume (after dilution) and 276.78 for Ni-conc

APPENDIX 5

Reported test method details for sample #16575:

lab	Material of the test vessel	Pretreatment of the test vessel	Degreasing the sample	Composition of the test solution	Analysis technique	Replicate analysis
110	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
213	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
310	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
339	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with detergent	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
348	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
362	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
551	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
623	Glass	Yes, with diluted Nitric Acid	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
840	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2102	Polypropylene	Yes, with 3% Nitric Acid overnight	Yes, with detergent	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2115	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2120	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, as per EN1811	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2121	Glass	Yes, with 5% Nitric Acid for 8 hrs.	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2129	Glass	No	Yes, solution not mentioned	---	ICP-MS	Yes
2131	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2132	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2135	Polypropylene	No	Yes, with detergent	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2139	Polypropylene	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2165	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2172	Glass	Yes, with 25% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2184	Polypropylene	Yes, with 5% Nitric Acid for 24 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2201	Polypropylene	Yes, solution and time not mentioned	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2213	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2229	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2232	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2236	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2238	Polypropylene	Yes, with 5% Nitric Acid for 24 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2246	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2247	---	---	---	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	---	---
2254	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2255	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2256	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	---	ICP-OES	Yes
2284	Polypropylene	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2289	Polypropylene	Yes, with 5% Nitric Acid for 12 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2290	---	Yes, solution and time not mentioned	Yes, solution not mentioned	---	---	Yes
2293	Glass	Yes, with 1% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2295	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No

lab	Material of the test vessel	Pretreatment of the test vessel	Degreasing the sample	Composition of the test solution	Analysis technique	Replicate analysis
2296	Polypropylene	No	Yes, solution not mentioned	---	ICP-OES	No
2300	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Alkylaryl Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2301	Glass	Yes, with 5% Nitric Acid overnight	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2310	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	AAS	Yes
2311	Glass	Yes, with 5% Nitric Acid for 4 hrs.	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	---	Yes
2320	Glass	Yes, with diluted Nitric Acid for 24 hrs.	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2347	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2352	Polypropylene	Yes, solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2357	Polypropylene	No	No	---	ICP-MS	No
2363	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	NaCl, C2H5COOH solution	ICP-OES	No
2365	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2366	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2369	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	---	---	Yes
2370	Polypropylene	Yes, with 10% Nitric Acid	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2375	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2377	Polystyrene	Yes, with 1% Nitric Acid for 8 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	FAAS	Yes
2379	---	Yes, solution and time not mentioned	Yes, solution not mentioned	---	ICP-MS	Yes
2380	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2385	Polypropylene	No	Yes, as per EN1811	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2390	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2403	Glass	Yes, with 5% Nitric Acid for 5 hrs.	Yes, with Anionic Surfactant	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2410	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2415	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2425	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2429	Glass	Yes, solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2432	Polypropylene	Yes, solution and time not mentioned	Yes, solution not mentioned	---	ICP-MS	No
2442	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2453	---	---	---	---	---	---
2459	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2462	Glass	Yes. Solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2468	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2475	Polypropylene	Yes, with 5% Nitric Acid for 5 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2489	Polypropylene	No	Yes, solution not mentioned	---	ICP-MS	No
2495	Polypropylene	No	Yes, with Sodium Alkylaryl Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2496	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2497	Glass	Yes. Solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2504	Polypropylene	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2508	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2511	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2516	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with detergent	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2522	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No

lab	Material of the test vessel	Pretreatment of the test vessel	Degreasing the sample	Composition of the test solution	Analysis technique	Replicate analysis
2538	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2544	Polypropylene	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2549	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2560	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2563	Glass	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2567	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2590	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2591	Glass	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2605	Glass	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2612	Polypropylene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	No
2624	Polypropylene	Yes, with 5% Nitric Acid overnight	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2629	Polypropylene	Yes. Solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2654	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2657	---	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2668	Polypropylene	Yes, with 5% Nitric Acid for 4 hrs.	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
2674	Polypropylene	Yes, with 5% Nitric Acid for 12 hrs.	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2701	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2709	Polystyrene	Yes, with DI water	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	GFAAS	Yes
2720	Polypropylene	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2737	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
2741	Glass	Yes. Solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2744	Polypropylene	No	Yes, with detergent	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
2754	Glass	Yes, with diluted Nitric Acid for 4 hrs.	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
3100	Glass	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3110	Polystyrene	No	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
3116	Glass	Yes, with diluted Nitric Acid for 4 hrs.	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3118	Glass	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
3124	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3146	Polypropylene	No	Yes, solution not mentioned	---	ICP-OES	Yes
3153	Glass	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3154	Polypropylene	No	No	---	ICP-OES	No
3160	Polypropylene	No	Yes, with detergent	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
3172	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3176	Glass	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3182	Polypropylene	Yes, with 10% Nitric Acid	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3185	Glass	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3190	Glass	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
3197	Polypropylene	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3200	Polypropylene	Yes, with 5% Nitric Acid for 24 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3209	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	No
3210	Polystyrene	No	Yes, solution not mentioned	---	ICP-OES	No

lab	Material of the test vessel	Pretreatment of the test vessel	Degreasing the sample	Composition of the test solution	Analysis technique	Replicate analysis
3218	Polypropylene	Yes, with 5% Nitric Acid for 4 hrs.	Yes, with Sodium Dodecyl Benzene Sulfonate solution	---	ICP-MS	Yes
3220	Glass	Yes. Solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3225	Polypropylene	No	Yes, with Sodium Dodecyl Benzene Sulfonate solution	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3228	Polystyrene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3233	Polystyrene	Yes. Solution and time not mentioned	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-OES	Yes
3237	Polypropylene	No	Yes, solution not mentioned	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes
3248	Glass	Yes. Solution and time not mentioned	No	Artificial Sweat Solution (NaCl, Lactic Acid, Urea)	ICP-MS	Yes

APPENDIX 6

Reported Surface Determination details for sample #16576

lab	How was the surface of the spoon measured and calculated.
110	-----
213	The calculation was made on considering that the surface of the spoon was the sum of many parts
310	-----
339	-----
348	Base surface is approximately drawed (its outline) on graph paper, cutted and weighed. The same procedure is repeated for a known area rectangular surface and an extrapolation is done. Lateral surface is calculated measuring perimeter and thickness, with caliper (perimeter with aid of a thread) and multiplying them. Total surface = base surface x 2 + lateral surface
362	-----
551	-----
623	-----
840	-----
2102	Surface is calculated by drawing the object on paper, cut the drawing and weighing the paper needed.
2115	-----
2120	modeling and software for Areas calculation
2121	we used a camera with a soft
2129	-----
2131	Surface and circumference of ellipsis formulas used from internet source (106.81 mm; 852.47 mm^2); (4.8 mm + 11 mm) x 70 mm + (5.5 mm)^2 x Pi + 106.81 mm + 70 mm + 70 mm + 11 mm x Pi + 2 x 852.47 mm^2 = 3187 mm^2
2132	Vernier caliper and nylon wire were used
2135	Subdividing Total-Area into known shapes - Curved lengths were approximated via thread
2139	Using foil, calculate the area in that created plane. A=Area of ellipse(S) x 2 (front & back) = π x 2.1 x 1.35 x 2 = 17.8 B=Spoon handle x 2 (front & back) = 0.8 x 8 x 2 = 12.8 C=Side = 0.1 x 27 = 2.7 => A+B+C = 33.3
2165	Equipment: Digital Caliper. Method: Divide the spoon area to an oval, trapezoid, hemicycle, then plus the side surfaces.
2172	For spoon, break into one ellipse, one trapezoid and one semicircle
2184	spoon area: calculated as 2 ovals; Handle area: calculated as 4 trapezoids
2201	treated the handle of the spoon as semi-ellipse plus trapezoid and the remained part as ellipse.
2213	By vernier caliper
2229	-----
2232	Separated into bowl A and handle B, A - rectangle + trapezium + triangle; B rectangle + triangle
2236	Surfaces were broken down into simple geometric shapes. The dimensions were measured using a vernier caliper. Use of planer symmetry was used to multiply results when possible.
2238	Vernier caliper, segment measurement
2246	Vernier Caliper and nylon wire were used
2247	considered length and breadth, simple calculation formula
2254	Typically determined using a 3D scanner, in this case the spoon was too large for our scanner and was cut into smaller pieces
2255	Comply Elipse + Trapigium +Oval
2256	-----
2284	-----
2289	Divide the sample into 3 part: ellipse spoon head , trapezoid spoon handle and half round end.
2290	-----
2293	Was calculated using the volume displaced of water by the spoon. Had measured the perimeter and used the follow equations: Volume (V) = superficial area (SA) * height(h) Superficial area= volume/ height Total area = 2 SA + (hxP)
2295	We measured the lengths with a caliper and divided the surface area into 4 different geometrical shapes
2296	using calipers
2300	The surface area is measured with graph paper.

lab	How was the surface of the spoon measured and calculated.
2301	Using millimeter block and calculate the surface area
2310	Add the surface area of the ellipse shape and cuboid shape of the spoon using vernier caliper.
2311	The total surface area of the object is the sum of the Oval surface and cuboid surface.
2320	tracing the back and front of the spoon on graph paper, calculating side surface with the thickness.
2347	-----
2352	-----
2357	-----
2363	use electronic ruler to measure the lenth and width and height and calculate
2365	-----
2366	separate the object as 2 semicircle, 6 trapezoid, calculated perimeter, then multiply by thickness
2369	-----
2370	Use graph paper attached to the sample after the cut. Then calculate the number of square graph paper (Large square = 0.25cm2 ; Small square = 0.01cm2); Front and back of each of 45 large and 365 small squares: (0.25cm2 X 45 + 0.01cm2 X 365) X 2 = 29.80cm2; Side 27.3 cm long, wide 0.105 cm (0.105 cm X 27.3 cm = 2.8665 cm2). The total surface area 29.80 cm2 + 2.8665 cm2 = 32.67 cm2
2375	Caliper
2377	-----
2379	-----
2380	-----
2385	Theoretrical reduction to regular geometrical shapes
2390	Eclips, Trapizide, Reactangle & half circle
2403	Divided the spoon surface into some small regular geometric graphics and a side surface
2410	-----
2415	-----
2425	Graph paper and Digiter Slide Calipers
2429	We division the spoon into three parts to calculate,head ,the middle part and tail
2432	-----
2442	We measured it as three types as ellipse, semi ellipse & rectangular prism
2453	-----
2462	digital calliper
2468	We traced an outline of the spoon head onto 1mm graph paper, making allowances for the concave and convex. Cut the traced area out and aligned with the spoon to ensure they were of the same dimensions. This approach was repeated for the front and back of the handle. Number of 1mm squares then counted to obtain area of front and back of spoon. To measure the the area of the edge, the perimeter of the spoon was measured and multiplied by the height of the edge. Total of front and back and edge were than added together to give overall area.
2475	-----
2489	We have considered as Eclipse and rectangle
2495	geometrically: decomposed in semicircle + trapeze + small trapeze + spherical cap + lateral sufrace
2496	mark the contour of the sample area
2497	3d-Scanner
2504	surface area come from 4 parts = spoon + handle + tail + around spoon
2508	volume displacement
2511	-----
2516	Used Digital caliper, Ruler and Tape measure.
2522	Our lab used multiple integral formula
2538	We projected the Surface on a piece of paper and calculated the surface with gravimetric analysis.
2544	The whole process was based on a microscope profile projector.
2549	-----
2560	We have consider ellipse and rectangular solid by using $2\pi ab+2(ab+bc+ca)$
2563	A=2xEllipse+2xTrapezium+2xCircleSegement+circulating area ; measured with vernier calliper

lab	How was the surface of the spoon measured and calculated.
2567	Area measurement: Marked the spoon one part is rectangular (straight line) and another part is circular (concave & convex). In rectangular shape measure length as “a”, average width as “b” and height as “c”. Then measure the area using formula 2(ab + bc + ca). In circular shape measure the average diameter then radius “r”. Then measure the area using formula 2 π r^2. Then outer side of circular shape measure the area using formula 2πrh (h is height). Finally make summation the above 3 areas.
2590	The surface of the object was calculated with caliper
2591	First we mark the surface of the sample with aluminium paper. Then we measure the surface of the aluminium paper with a vernier caliper with a precision of 0.01mm.
2605	Trapezoid+Ellipse
2612	measured as ellipse and 3 rectangles
2624	I consider the object as composed by simple geometrical forms. I measure them with a calliper.
2629	-----
2654	projection +masse-area equivalence
2657	-----
2668	Rectangle solid (spoon handle & neck portion) & Ellipse(spoon bowl portion)
2674	We regarded the spoon surface as a conbination of oval and rectangle, then add them up.
2701	-----
2709	The metal spoon is projected on paper and divided into several parts for calculation.
2720	2 the elliptical area + 2 trapezoidal area + side a rectangle area
2737	I delineated the outline of sample on paper, then divided it into some geometrical sections.
2741	We divided sample to some parts then check their dimension/ area individual.
2744	Total surface (sum of both sides and thickness) has been calculated by using Autocad.
2754	measured by calibrated ruler
3100	-----
3110	-----
3116	Use calibrated caliper to measure the metal plate and calculate the surface
3118	sample divided by 3 shapes. A is the ellipse shape. B is trapezoidal shape, C is half of ellipse.
3124	-----
3146	-----
3153	Geometric approximation
3154	-----
3160	First of all, we separate the measure in three parts, a neck, a handle and a hollow part of the spoon. We consider the hollow part like an ellipse. And we consider the handle and the neck like a trapezoid. The round part of the handle is like a half of ellipse. We measure the perimeter of the spoon with an adhesive tape.
3172	-----
3176	Total surface of spoon was taken into account while calculating. We calculate the area by using graph paper (mm)
3182	-----
3185	-----
3190	-----
3197	-----
3200	seperate the object into 4 parts,and calculate the parts
3209	-----
3210	-----
3218	Regarded the sample as a trapezoid and an oval shaped, and measured by digital caliper.
3220	Graph Paper
3225	The border of the sample is drawn in an area sheet. And then cut it out and weighed. The weight of the area sheet of sample is compared with a reference area sheet (5x5cm) and the area of the sample is calculated.
3228	attach a paper with the spoon and draw the spoon picture in the paper, calculate the area in paper
3233	-----
3237	-----
3248	-----

APPENDIX 7

Number of participants per country

5 labs in	BANGLADESH
1 lab in	BRAZIL
1 lab in	BULGARIA
1 lab in	CAMBODIA
1 lab in	DENMARK
5 labs in	FRANCE
9 labs in	GERMANY
1 lab in	GUATEMALA
11 labs in	HONG KONG
9 labs in	INDIA
3 labs in	INDONESIA
7 labs in	ITALY
1 lab in	JAPAN
3 labs in	KOREA
2 labs in	MOROCCO
33 labs in	P.R. of CHINA
2 labs in	PAKISTAN
2 labs in	PORTUGAL
1 lab in	SINGAPORE
3 labs in	SPAIN
1 lab in	SRI LANKA
1 lab in	SWITZERLAND
1 lab in	TAIWAN R.O.C.
3 labs in	THAILAND
2 labs in	THE NETHERLANDS
1 lab in	TUNISIA
6 labs in	TURKEY
3 labs in	U.S.A.
2 labs in	UNITED KINGDOM
5 labs in	VIETNAM

APPENDIX 8

Abbreviations:

C	= final test result after checking of first reported suspect test 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
R(0.01)	= outlier in Rosner's outlier test
R(0.05)	= straggler in Rosner's outlier test
E	= probably an error in calculations
U	= test result probably reported in a different unit
W	= test result withdrawn on request of participant
ex	= test result excluded from calculations
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported

Literature:

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