From: Jackie Deans [mailto:j.k.deans@bham.ac.uk]
Sent: 23 October 2012 09:26
To: mike@secur-i-disc.co.uk
Subject: Analysis of lead and cadmium in samples

Dear Mike,

Thank you for your enquiry about lead and cadmium impurities in tax disc holders. As I mentioned, I'm not sure X-Ray fluorescence can help because of the thickness of the holders but I am willing to give it a try.

If you could send me a few holders that I can cut up to get sufficient depth of sample I will send you the results as soon as I have them.

Please send the holders to the address in my email signature.

Best wishes,
Jackie

Dr Jacqueline Deans
Facilities Manager
Science City Advanced Materials 1 Project School of Chemistry
University of Birmingham Edgbaston, Birmingham, B15 2TT, UK

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From: Mike Prince [mike@secur-i-disc.co.uk]
Sent: 23 October 2012 14:51
To: 'Jackie Deans'
Subject: RE: Analysis of lead and cadmium in samples

Hi Jackie,

Many thanks for the email.

We have sent you a package by courier which will be with you tomorrow.

Please contact me if you have any questions.

Thanks,

Mike

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From: Jackie Deans [mailto:j.k.deans@bham.ac.uk]
Sent: 24 October 2012 13:35
To: Mike Prince
Subject: RE: Analysis of lead and cadmium in samples

Dear Mike,

Your samples arrived in the mail this morning and I have run them on the X-ray fluorescence spectrometer.

The results should be considered as a best guess estimate of the elements presented, they were run on our semi-quantitive program which does not need any calibrated standards, accordingly, the statistical error associated with such measurements can be in the

order of +/- 5 to 10% by weight (an estimate of the statistical error is given in the attached Excel file).

I found Lead in samples A, B, C and D and Cadmium in samples A and D. Neither element was present in sample E.

You will see from the spreadsheet that the amounts detected do not add up to 100%, this is because elements below sodium in the periodic table (for example oxygen and carbon) are invisible to XRF and will not be detected.
This is why the amount detected in sample E is particularly low.

Best wishes,
Jackie

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From: Mike Prince [mailto:mike@secur-i-disc.co.uk]
Sent: 25 October 2012 10:46
To: 'Jackie Deans'
Subject: RE: Analysis of lead and cadmium in samples

Hi Jackie,

Many thanks for the results, they are very interesting.

Please can we check that we understand the results correctly?

As an example, the Weight% value for lead in sample C is 0.23%, are we correct in assuming that this equates to 2,300 ppm?

Many Thanks,

Mike

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From: Jackie Deans [mailto:j.k.deans@bham.ac.uk]
Sent: 25 October 2012 10:54
To: Mike Prince
Subject: RE: Analysis of lead and cadmium in samples

Dear Mike,

Yes, that is correct.

Best wishes,
Jackie

Key to Samples:	
Sample	Manufacturer / Purchased From
A	ESPOSTI / Four Oaks Post Office
B	ESPOSTI / Halesowen Post Office
C	Carcare / Select & Save, Harbourne
D	Halfords / Halfords, Perry Bar
E	Secur-i-Disc ECO HOLDER®

Sample A				
% of sample detected	74.80%			
Formula	Weight %	Statistical Error	Lower Limit of Detection	Analyzed Layer
Cl	61.81%	0.19%	233.4 PPM	87 um
Ca	12.20%	0.45%	106.3 PPM	28.8 um
Ti	0.32%	2.68%	99.0 PPM	40 um
Ba	0.16%	8.98%	383.8 PPM	38 um
Pb	**0.08%**	**3.11%**	**58.6 PPM**	**0.67 mm**
Mg	0.05%	8.95%	89.4 PPM	12.3 um
P	0.04%	6.86%	43.2 PPM	43 um
Zn	0.04%	2.84%	26.8 PPM	229 um
Cd	**0.04%**	**8.05%**	**87.2 PPM**	**4.1 mm**
Si	0.03%	11.30%	58.6 PPM	29.1 um
S	0.02%	8.12%	34.2 PPM	62 um
Al	0.02%	15.90%	69.9 PPM	19.1 um
Fe	0.02%	8.73%	46.2 PPM	100 um
Sr	59 PPM	8.57%	16.8 PPM	0.94 mm

Sample B				
% of sample detected	76.50%			
Formula	Weight %	Statistical Error	Lower Limit of Detection	Analyzed Layer
Cl	62.31%	0.19%	244.3 PPM	84 um
Ca	13.25%	0.44%	111.0 PPM	28.4 um
Ba	0.26%	6.45%	365.3 PPM	37 um
Ti	0.23%	3.19%	100.3 PPM	38 um
Pb	**0.12%**	**2.30%**	**59.5 PPM**	**0.65 mm**
Cd	0.07%	4.79%	91.1 PPM	3.9 mm
P	0.06%	5.66%	46.9 PPM	41 um
Mg	0.05%	8.17%	89.9 PPM	11.9 um
Zn	0.05%	2.66%	27.2 PPM	222 um
Si	0.02%	14.00%	61.8 PPM	28.1 um
S	0.02%	10.40%	35.9 PPM	60 um
Fe	0.02%	9.62%	48.2 PPM	97 um
Sr	46 PPM	10.90%	17.0 PPM	0.91 mm

Sample C				
% of sample detected	73.90%			
Formula	Weight %	Statistical Error	Lower Limit of Detection	Analyzed Layer
Cl	54.53%	0.20%	221.3 PPM	82 um
Ca	18.48%	0.36%	110.6 PPM	32 um
Pb	**0.23%**	**1.47%**	**61.4 PPM**	**0.65 mm**
Ti	0.21%	3.44%	95.7 PPM	38 um
Ba	0.11%	11.40%	361.5 PPM	37 um
Mg	0.06%	7.53%	90.8 PPM	11.8 um
Si	0.06%	7.07%	59.5 PPM	27.8 um
S	0.04%	5.63%	36.8 PPM	59 um
Al	0.04%	10.20%	70.9 PPM	18.3 um
P	0.03%	8.53%	45.4 PPM	41 um
Fe	0.03%	6.68%	50.0 PPM	97 um
Zn	0.03%	4.18%	27.5 PPM	221 um
K	0.02%	17.60%	102.7 PPM	23.7 um
Cu	0.01%	8.38%	30.4 PPM	181 um
Sr	61 PPM	8.72%	17.5 PPM	0.90 mm

Sample D				
% of sample detected	75.70%			
Formula	Weight %	Statistical Error	Lower Limit of Detection	Analyzed Layer
Cl	52.20%	0.20%	216.2 PPM	78 um
Ca	22.40%	0.32%	113.4 PPM	33 um
Ti	0.38%	2.51%	99.5 PPM	37 um
Ba	0.13%	9.95%	394.4 PPM	36 um
Pb	**0.13%**	**2.26%**	**62.8 PPM**	**0.62 mm**
Al	0.10%	5.21%	75.7 PPM	17.3 um
S	0.10%	3.24%	35.2 PPM	56 um
Mg	0.07%	6.79%	96.1 PPM	11.2 um
Si	0.05%	7.44%	60.8 PPM	26.3 um
P	0.05%	6.52%	47.6 PPM	39 um
Fe	0.03%	5.62%	47.7 PPM	92 um
Cd	**0.03%**	**10.80%**	**92.0 PPM**	**3.7 mm**
Zn	0.03%	4.16%	27.9 PPM	210 um
K	0.02%	14.00%	142.9 PPM	24.4 um
Cu	99 PPM	10.30%	31.5 PPM	173 um
Sr	72 PPM	7.54%	17.9 PPM	0.86 mm

Sample E				
% of sample detected	1.10%			
Formula	Weight %	Statistical Error	Lower Limit of Detection	Analyzed Layer
K	0.26%	4.32%	2.3 PPM	0.75 mm
Cl	0.17%	7.71%	2.0 PPM	0.57 mm
Ti	0.16%	5.83%	4.1 PPM	1.09 mm
Fe	0.10%	5.93%	4.7 PPM	2.15 mm
S	0.08%	7.90%	1.4 PPM	0.49 mm
Zn	0.06%	6.62%	5.3 PPM	3.6 mm
Mn	0.06%	9.07%	4.8 PPM	1.71 mm
Cu	0.05%	7.89%	5.2 PPM	3.00 mm
Si	0.05%	12.60%		0.30 mm
Zr	0.04%	11.20%	9.0 PPM	15.3 mm
Al	0.03%	14.40%		217 um