Application Brief

SII

SEA NO.27 JUN.2002

SII NanoTechnology Inc.
RBM Tsukiji Bldg.
Shintomi 2-15-5, Chuo-ku, Tokyo 104-0041, Japan
URL：http://www.siint.com

Analytical correction of cadmium within plastic

1. Overview

When analyzing for cadmium in plastic, the Cd fluorescent X-ray line (K alpha line) energy used as the analysis line is high, approximately 23.2 keV, and therefore, the saturation thickness in light elements (when fluorescent X-ray intensity does not rely on sample thickness), such as polyvinyl chloride in a sample matrix, is estimated at about 5 mm or greater. Nonetheless, assuming that the measurement is non-destructive, you should not expect the actual analysis sample to reach the saturation thickness. This application brief reports that analysis is possible through normalized correction by scatter ray intensity, regardless of the shape and thickness of the sample.

2. Analysis Conditions.

Table 1 shows the analytical conditions.

Table 1 Analysis Conditions

Measurement Tool	SEA2120
Time	240 seconds
Chamber Atmosphere	Air
Collimator	ϕ 10.0 mm
Voltage	50 kV
Current	200 µA
Filter	Zr (t : 0.2 mm)

3. Experiment and Results

We prepared a polyvinyl chloride sheet at a thickness of 1 mm, then analyzed 1 to 4 overlapping sheets and checked for differences when correction is performed and when it is not performed. One sheet was used for creating the calibration curve. The results are displayed in Table 2.

Table 2 Analysis Results

No. of sheets	Without correction (ppm)	With correction (ppm)
1	59	59
2	95	60
3	94	54
4	106	54

When no correction is performed, the change in the Cd intensity from change in sample thickness is reflected as direct error in the analysis value. Nevertheless, we obtained stable readings by correction regardless of the thickness of the sample.

4. Sample Analysis

We analyzed Cd within a 2 mm in diameter plastic ball. One sample was extracted from a group of identical samples and was cross-checked using a fluorescent X-ray analyzer and an ICP analyzer. The results of our analysis are displayed in table 3. Fluorescent X-ray analysis was repeated 10 times on the same sample. This became the statistical base of the measurement.

Table 3 Comparison with ICP-OES

ICP-OES	Fluorescent X-ray Method					
	Mean	SD	CV%	Range	Max	Min
430	416	13.4	3.22	40	436	396

Units: ppm

By using the normalized correction method from scattered ray intensity, good results can be obtained even for samples that are small in relation to the X-ray beam thickness, without the sample reaching saturation thickness.