

# Application Note

## EDXRF Analysis of Chromium, Lead and Cadmium in Metals (Brass)

Field: Electrical and electronic equipment, Environmental, Recycling



Restriction of Hazardous Substance (RoHS) will be implemented in European Union (EU) as environmental efforts. In this situation, it is getting more important to measure the hazardous elements in electrical and electronic equipments. EDXRF is getting used for screening method generally because EDXRF can measure various sample states (solid, powder, liquid and so on) as non destructive and rapid analysis technique. In this report, the sensitivity and

### ■ Sample

Brass samples included Cr, Pb, Cd made by Sumitomo Metal Technology Inc.

Sample	Concentration (ppm)		
	Cr	Pb	Cd
GBR1	<10	<10	<10
GBR2	960	1000	60
GBR3	450	200	20
GBR4	1120	100	40
GBR5	70	1200	170
GBR6	160	510	140



Above concentration value is calibrated by ICP/MS.

### ■ Result - Lower Limits of Detection -

Element	Cr (K $\alpha$ )	Pb (L $\alpha$ )	Pb (L $\beta$ 1)	Cd (K $\alpha$ )
Voltage (kV)	30	50	50	50
Current (uA)	20	121	121	1000
Measurement time (sec.)	300	300	300	300
L.L.D. (ppm)	<b>33.9</b>	<b>69.3</b>	<b>35.5</b>	<b>8.2</b>

- The measurement conditions of each element are optimized.
- The calculation of Lower Limits of Detection (L.L.D.) is used below formula.

\*The formula of L.L.D.

$$L.L.D. = 3 \times k \times \sqrt{\frac{I_{back}}{T}}$$

k Calibration curve constant

$I_{back}$  Background intensity

T Measurement time

■ **Result - Calibration Curve -**

The calibration curves of each element are shown in Fig. 1 to Fig. 4.

Fig.1 Calibration curve for Cr-Ka

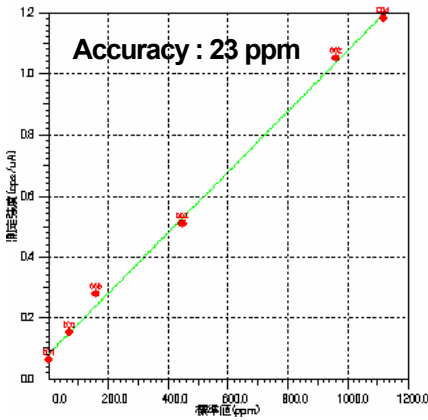


Fig.2 Calibration curve for Pb-La

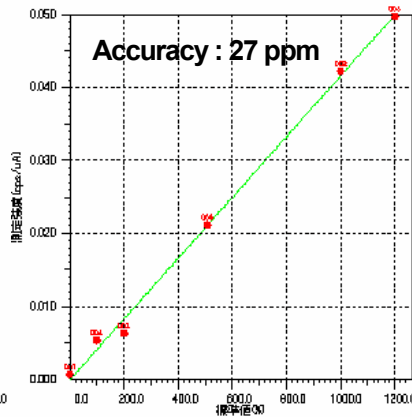


Fig.3 Calibration curve for Pb-Lb1

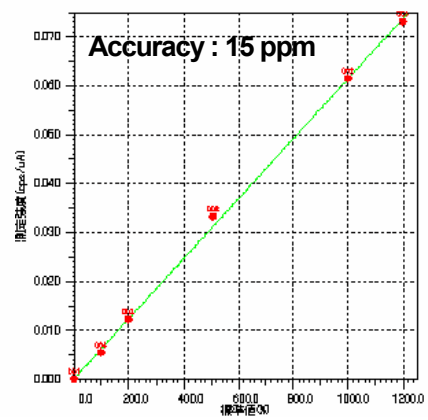
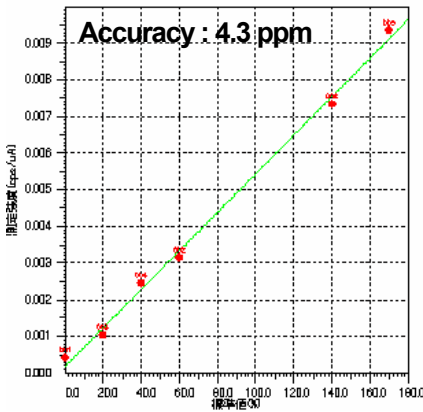


Fig.4 Calibration curve for Cd-Ka



■ **Result - Repeatability Test -**

Using the brass sample (BCR6) measures the 10 times repeatability test.

Element	Cr (Ka)	Pb (La)	Pb (Lb1)	Cd (Ka)
<b>Standard value (ppm)</b>	<b>160</b>	<b>510</b>		<b>140</b>
<b>Quantitative value (ppm) as average</b>	<b>138.4</b>	<b>513.5</b>	<b>495.2</b>	<b>138.5</b>
Standard Deviation (ppm)	9.2	38.2	29.1	4.2
<b>Practical CV(%)</b>	<b>6.7</b>	<b>7.4</b>	<b>5.9</b>	<b>3.0</b>
<b>Theoretical CV(%)</b>	<b>2.7</b>	<b>3.6</b>	<b>3.0</b>	<b>2.1</b>

\*Standard value is calibrated by ICP/MS.

■ **Analytical Conditions**

Instrument	: EDX-720	X-ray Tube	: Rh target
Atmosphere	: Air	Measurement Diameter	: 10 mmφ
Measurement Time	: 300 sec	Dead Time	: 40 %
Filter	: Without (for Cr), New Filter #1 (for Pb), New Filter #2 (for Cd)		
Voltage - Current	: 50 kV - (Auto) μA except for Cr      Cr : 30kV - (Auto) μA		

The given specifications serve purely as technical information for the user. No guarantee is given on technical specification of the described product and/or procedures.