

VA Application Note No. V - 185

Title: Cadmium and lead in electronic components as part of electrotechnical products

Summary: The EU directive on «Restriction of Hazardous Substances» (RoHS) requires the testing of four regulated heavy metals (Pb, Hg, Cd, Cr(VI)) in electrotechnical products. After sample preparation according to IEC 62321 the determination of lead and cadmium in electronic components can be carried out by anodic stripping voltammetry (ASV) using ammonium oxalate buffer pH 2.

Sample: Electronic components
Sample preparation: Approx. 2 g of the ground sample is digested with aqua regia as described in IEC 62321.

Analysis of Cd, Pb

Electrolyte Ammonium oxalate buffer pH 2
 c(ammonium oxalate) = 0.1 mol/L

Measuring solution 10 mL ultrapure water
 + 1 mL ammonium oxalate buffer pH 2
 + 0.25 mL digested sample solution
 (equals approx. 2 mg of the ground sample)

Working electrode (WE) **MME** (Multi Mode Electrode) 6.1246.020
 With silanized capillary 6.1226.050

Auxiliary electrode (AE) **Pt** 6.0343.000

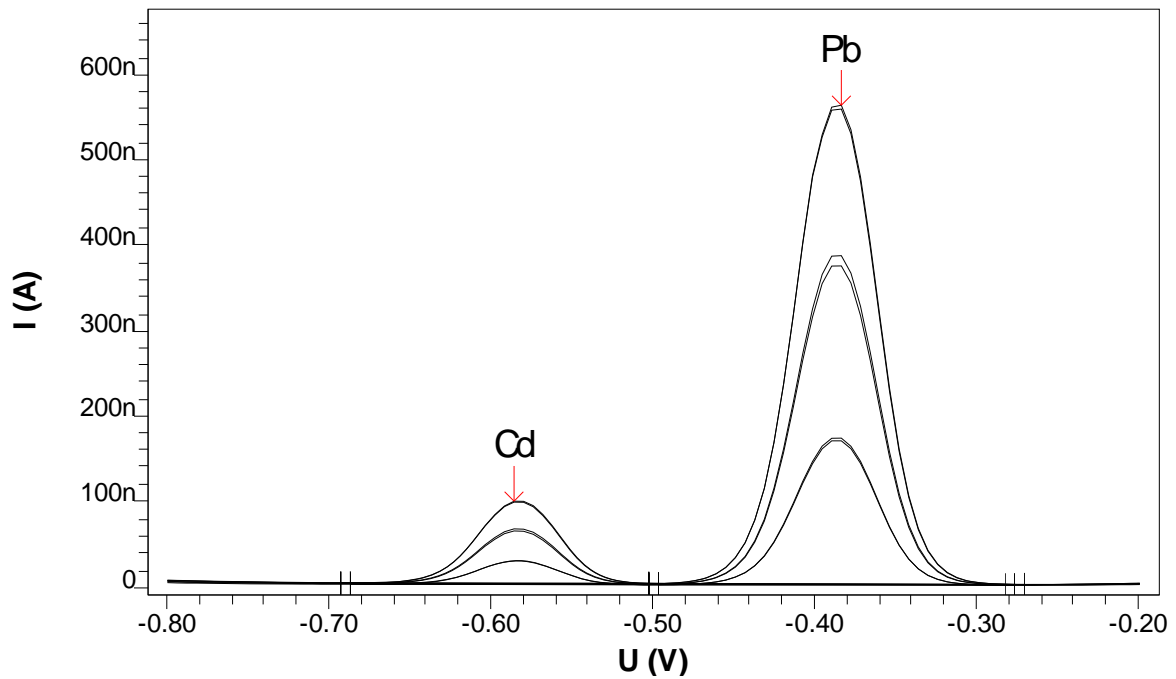
Reference electrode (RE) Reference system: Ag/AgCl/KCl (3 mol/L) 6.0728.020
 Intermediate electrolyte: c(KCl) = 3 mol/L 6.1245.010

Parameters	
Working electrode	HMDE
Stirrer speed	2000 rpm
Mode	DP
Purge time	300 s
Deposition potential	-0.85 V
Deposition time	30 s
Equilibration time	10 s
Pulse amplitude	0.05 V
Start potential	-0.8 V
End potential	-0.2 V
Voltage step	0.006 V

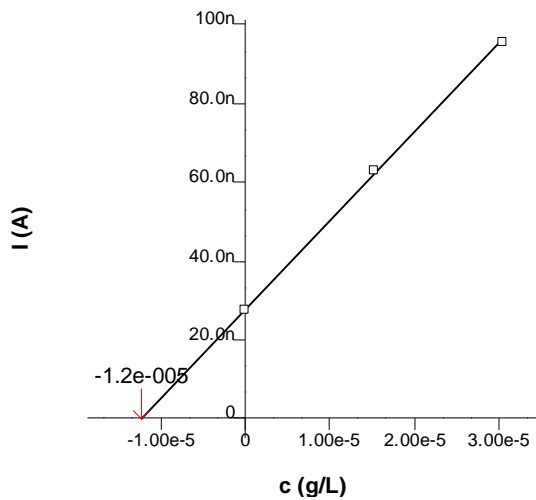
Voltage step time	0.6 s
Sweep rate	0.01 V/s
Peak potential Cd	-0.6 V
Peak potential Pb	-0.4 V

Results:	Cd	Pb
	99.4 mg/kg	1068.2 mg/kg

Determination of Cd and Pb



Cd
 $c = 99.435 \text{ mg/kg}$
 $\pm 2.763 \text{ mg/kg (2.78\%)}$



Pb
 $c = 1068.221 \text{ mg/kg}$
 $\pm 40.332 \text{ mg/kg (3.78\%)}$

