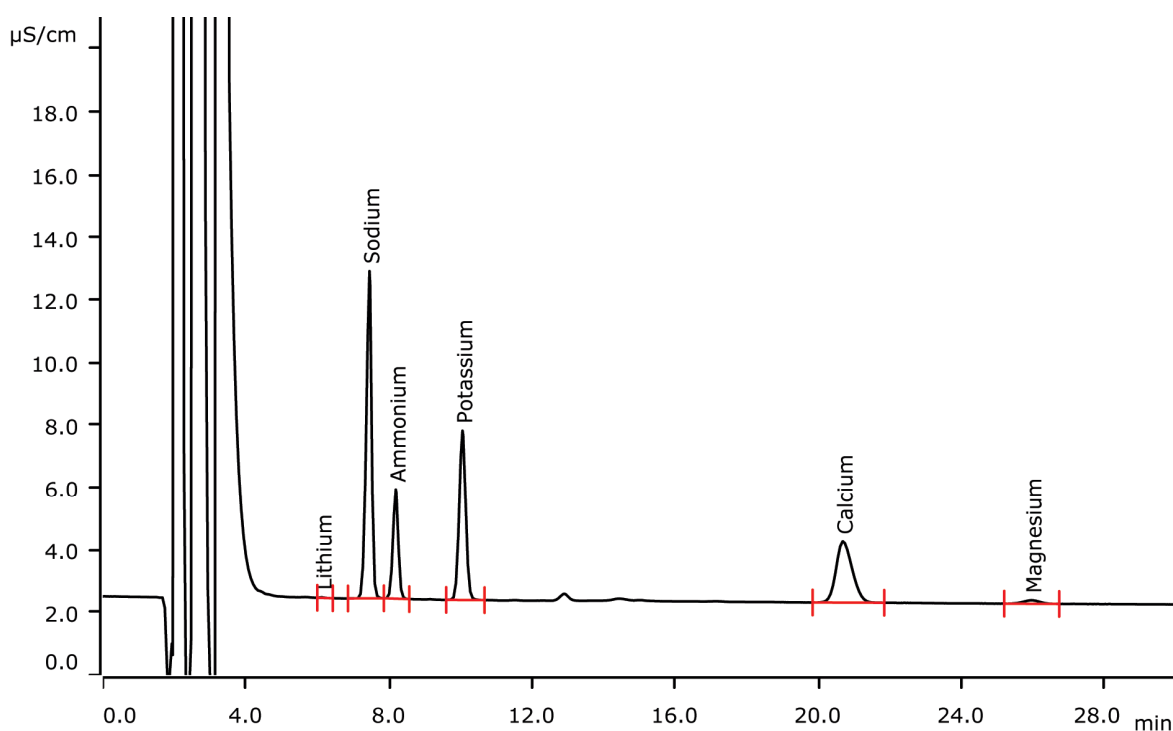


Determination of cations on the surface of printed circuit boards



Cleanliness is an indispensable condition in production of electronics. Especially ionic contamination can reduce the quality of products. Here, the determination of cations on the surface of circuit board materials is shown. The method applies intelligent Partial Loop Technique (MiPT) from one sample to both anion and cation channel. See AN-S-317 for anion determination.

Results

| Cation | Conc. [$\mu\text{g}/\text{cm}^2$] | Cation | Conc. [$\mu\text{g}/\text{cm}^2$] |
|----------|-------------------------------------|-----------|-------------------------------------|
| Lithium | < 0.001 | Potassium | 0.872 |
| Sodium | 0.746 | Calcium | 0.475 |
| Ammonium | 0.192 | Magnesium | 0.016 |

Sample

Printed circuit board (PCB)

Sample preparation

The PCBs are leached with isopropanol/water 10/90% in a plastic bag according to ICP-TM-650 Test methods manual, No 2.3.28.2. Injection with intelligent Partial Loop Injection Technique (MiPT).

Columns

| | |
|------------------------|------------|
| Metrosep C 4 - 250/4.0 | 6.1050.430 |
| Metrosep C 4 Guard/4.0 | 6.1050.500 |

Solutions

| | |
|---------------------------------------|---|
| Eluent (941 Eluent Production Module) | 1.7 mmol/L nitric acid 1.0 mmol/L dipicolinic acid |
| Extraction solution | 10% isopropanol in ultrapure water |

Analysis

Direct conductivity detection

Instrumentation

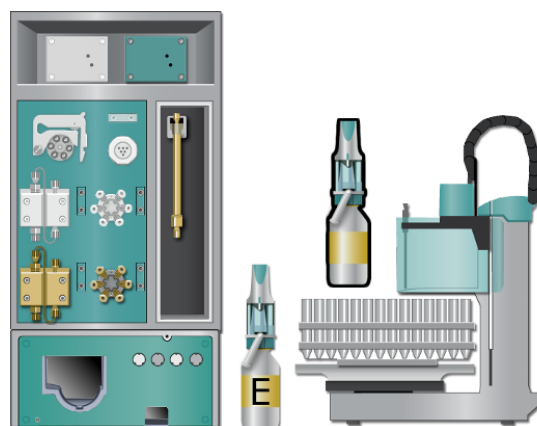
| | |
|---|------------|
| 940 Professional IC Vario TWO/SeS/PP | 2.940.2500 |
| 2 × IC Conductivity Detector | 2.850.9010 |
| 941 Eluent Production Module | 2.941.0010 |
| 2 × 800 Dosino (MiPT, Eluent Cations) | 2.800.0020 |
| 858 Professional Sample Processor | 2.858.0010 |
| MSM-HC Rotor A | 6.2842.000 |
| IC equipment: Additional eluent for 941 | 6.5330.090 |
| IC equipment: MiPT | 6.5330.180 |
| Sensor Empty 2 L (Eluent Cat) | 6.2769.110 |

Parameters

| | |
|--------------------|---------------|
| Flow rate | 1.0 mL/min |
| Injection volume | 100 µL (MiPT) |
| P _{max} | 20 MPa |
| Recording time | 30 min |
| Column temperature | 45 °C |

Calibration MiPT

| | |
|--------------------|--------------------------|
| Calibration range | Factor of 5 |
| Standard solution: | |
| Lithium | 0.05 mg/L |
| All others | 0.5 mg/L |
| 1. Level | 20 µL = 0.05 / 0.5 mg/L |
| 2. Level | 40 µL = 0.10 / 1.0 mg/L |
| 3. Level | 60 µL = 0.15 / 1.5 mg/L |
| 4. Level | 80 µL = 0.20 / 2.0 mg/L |
| 5. Level | 100 µL = 0.25 / 2.5 mg/L |



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Flow chart

The graphic below shows the system setup for the simultaneous determination of anions and cations in leaching solutions applying Metrohm intelligent Partial Loop Technique (MiPT). The sample is loaded to the two IC channels by a single 800 Dosino (2nd segment from the left). The eluents are automatically produced by the 941 Eluent Production Module (2nd segment from the right). Ultrapure water for eluent preparation and rinsing is provided by a ELGA PURELAB flex 5 ultrapure water supplying instrument.

