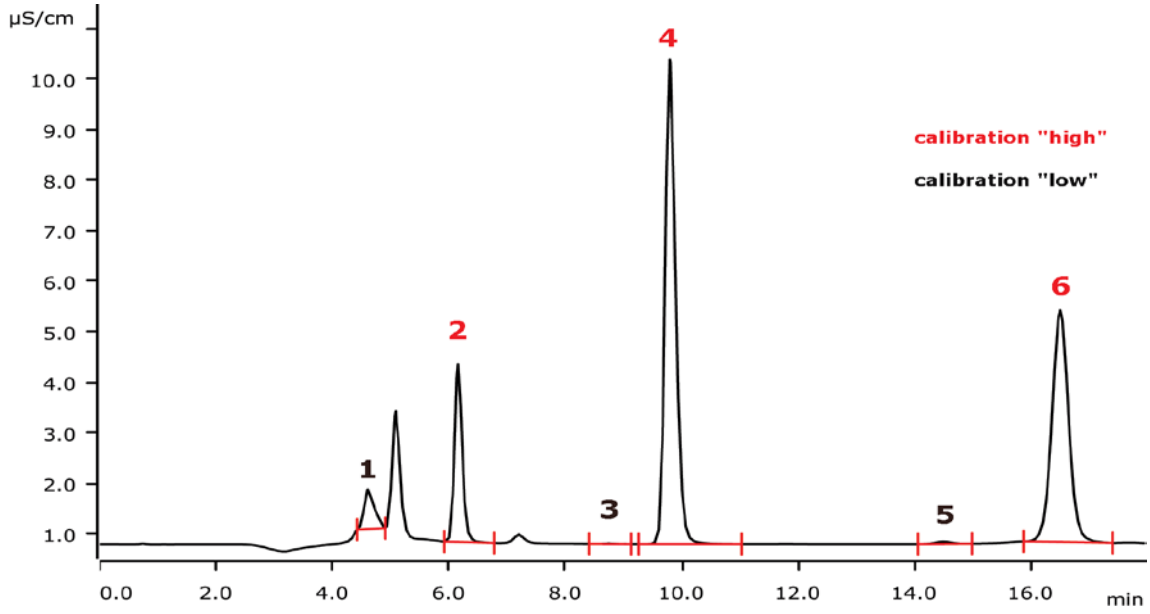
IC Application Note S–349

High-low calibration technique: large calibration range with intelligent Partial Loop Injection Technique



In ion chromatography with suppressed conductivity detection, calibration curves quite often are not really linear. Especially, if a calibration needs to cover a large concentration range, results will be more accurate when multiple calibration curves for different concentration ranges are applied. The MagIC Net software allows to apply multiple calibration curves within one single determination. This means that for every ion the optimal calibration is applied, improving the accuracy of the results. This method is applied to rain water samples.

Results

Anion	Concentration [mg/L]	Anion	Concentration [mg/L]
1 Fluoride	0.046	4 Nitrate	1.420
2 Chloride	0.243	5 Phosphate	0.031
3 Bromide	0.003	6 Sulfate	0.868

Black results from calibration “low”, red from calibration “high”

Metrohm

Sample

Rain water

Sample preparation

Injection by Metrohm intelligent Partial Loop Injection Technique

Columns

Metrosep A Supp 5 - 150/4.0	6.1006.520
Metrosep A Supp 4/5 Guard/4.0	6.1006.500

Solutions

Eluent	3.2 mmol/L sodium carbonate 1.0 mmol/L sodium hydrogen carbonate
Suppressor regenerant	250 mmol/L sulfuric acid
Rinsing solution	STREAM

Analysis

Conductivity detection after sequential suppression

Instrumentation

940 Professional IC Vario ONE/SeS/PP	2.940.1500
IC Conductivity Detector	2.850.9010
858 Professional Sample Processor	2.858.0020
800 Dosino	2.800.0010
MSM Rotor A	6.2832.000
Adapter sleeve for Suppressor Vario	6.2842.020
IC equipment: MiPT	6.5330.180

Parameters

Flow rate	0.7 mL/min
Injection volume	2–200 µL (MiPT)
P_{max}	20 MPa
Recording time	18 min
Column temperature	35 °C

Calibration MiPT

Calibration range	Factor of 100
Calibration low	0.01 to 0.2 mg/L
Calibration high	0.2 to 5.0 mg/L
Standard solution:	
A (0.01 to 0.2 mg(L)	0.2 mg/L
B (0.5 to 5.0 mg/L)	5.0 mg/L
1. Level (low)	10 µL A = 0.01 mg/L
2. Level (low)	20 µL A = 0.02 mg/L
3. Level (low)	50 µL A = 0.05 mg/L
4. Level (low)	100 µL A = 0.10 mg/L
5. Level (low / high)	200 µL A = 0.20 mg/L
6. Level (high)	20 µL B = 0.50 mg/L
7. Level (high)	40 µL B = 1.0 mg/L
8. Level (high)	120 µL B = 3.0 mg/L
9. Level (high)	200 µL B = 5.0 mg/L

Calibration procedure

MagIC Net allows to have multiple data acquisitions (Analysis) in a method. Analysis “low” is calibrated with levels 1 through 5. Analysis “high” is calibrated with leves 5 through 9. Both Analysis’ are calculating results for all components. MagIC Net finally checks for each component which calibration has to be applied and summarizes the correct results. As the level 5 is part of both calibrations all results match one of the calibration ranges.