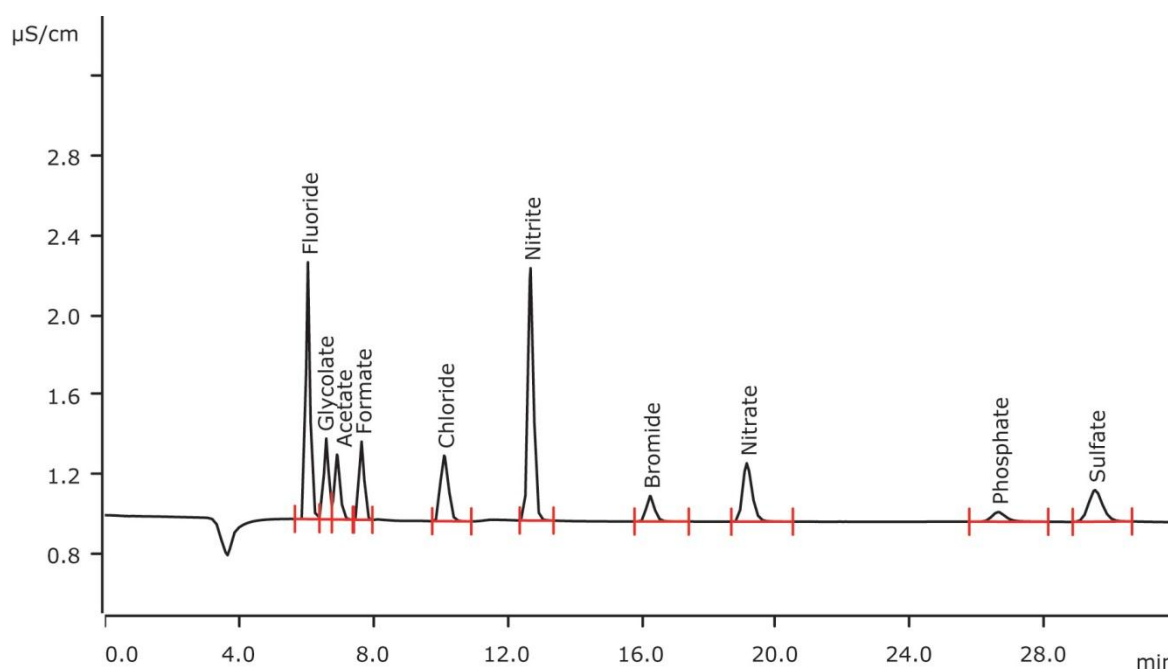


Online analysis of trace anions in borated water of a pressurized water reactor (PWR)



Water of the primary circuit of pressurized water reactors (PWR) contains boron for neutron absorption. The high borate content interferes with the direct analysis of trace anions. Inline Neutralization combined with variable preconcentration and Inline Matrix Elimination (MiPCT-ME) allows to remove boron as boric acid before injection.

Results

	Spiked concentration [μg/L]
Fluoride, glycolate, acetate, formate, chloride	5.0
Nitrite (from matrix)	n.q.
Bromide, nitrate, phosphate, sulfate	5.0

Sample

Artificial water sample from the primary circuit spiked with 2.0 g/L boron and 3.3 mg/L lithium hydroxide

Sample preparation

Inline Neutralization, Inline Preconcentration and Inline Matrix Elimination

Columns

Metrosep A Supp 7 - 250/4.0	6.1006.630
Metrosep A Supp 4/5 Guard/4.0	6.1006.500
Metrosep A PCC 1 HC/4.0	6.1006.310

Solutions

Eluent (inline eluent preparation)	3.6 mmol/L sodium carbonate
Suppressor regenerant	100 mmol/L sulfuric acid
SPM regenerant	10 mmol/L oxalic acid
Rinsing solutions	Ultrapure water

Analysis

Conductivity after sequential suppression

Parameters

Flow rate	0.8 mL/min
Injection volume	2000 µL
P _{max}	15 MPa
Recording time	32 min
Column temperature	45 °C

Instrumentation

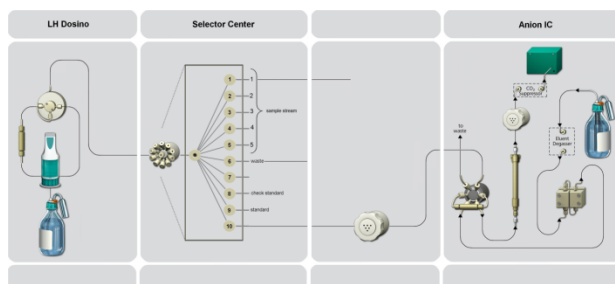
850 Professional IC Anion – MCS – Prep 3	2.850.2190
IC Conductivity Detector	2.850.9010
872 Extension Module Liquid Handling	2.872.0060
800 Dosino (liquid handling)	2.800.0010
849 Level Control for Inline Eluent Preparation	2.849.1030

Calibration MiPCT-ME

Calibration range	Factor of 40
Standard solution:	20 µg/L
1. Level	0.5 µg/L = 50 µL
2. Level	1.0 µg/L = 100 µL
3. Level	2.0 µg/L = 200 µL
4. Level	5.0 µg/L = 500 µL
5. Level	10.0 µg/L = 1000 µL
6. Level	20.0 µg/L = 2000 µL



Flow chart



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