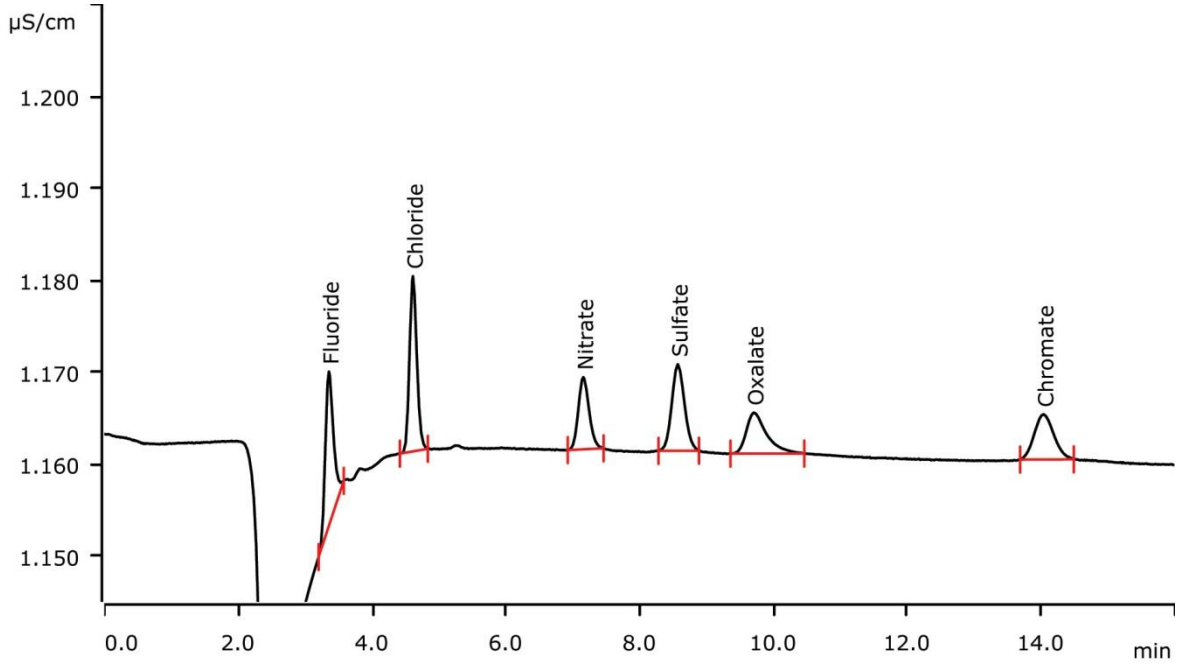
IC Application Note S–306

Trace anions including chromate in water-steam circuit of a boiling water reactor (BWR)



Water of the water-steam circuit of boiling water reactors (BWR) needs to be free of corrosive anions. Analyzing these trace anions allows the parallel determination of chromate, which is a potential corrosion product. Automated sample preparation includes variable Inline Preconcentration (MiPCT) and automatic calibration with a single multi-ion calibration standard.

Results

	Concentration [µg/L] (n= 6)	RSD [%] (n= 6)	Recovery [%] (n= 6)
Fluoride	0.11	4.4	109
Chloride	0.21	1.7	104
Nitrate	0.23	2.7	113
Sulfate	0.21	2.3	106
Oxalate	0.20	8.2	100
Chromate	0.19	3.6	96

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Sample

Standard solution

Sample preparation

Inline Preconcentration (MiPCT)

Columns

Metrosep A Supp 5 - 150/4.0	6.1006.520
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)	4.8 mmol/L sodium carbonate 1.5 mmol/L sodium hydrogen carbonate
Suppressor regenerant	100 mmol/L sulfuric acid
Rinsing solution	Ultrapure water

Parameters

Flow rate	0.8 mL/min
Injection volume	40 µL
P_{max}	15 MPa
Recording time	16 min
Column temperature	30 °C

Analysis

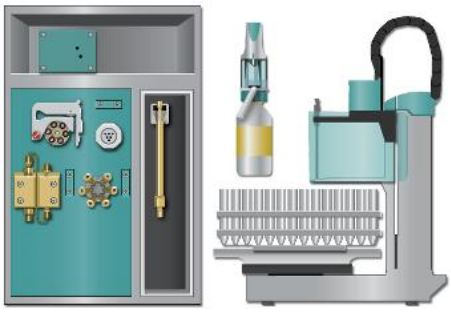
Conductivity after sequential suppression

Instrumentation

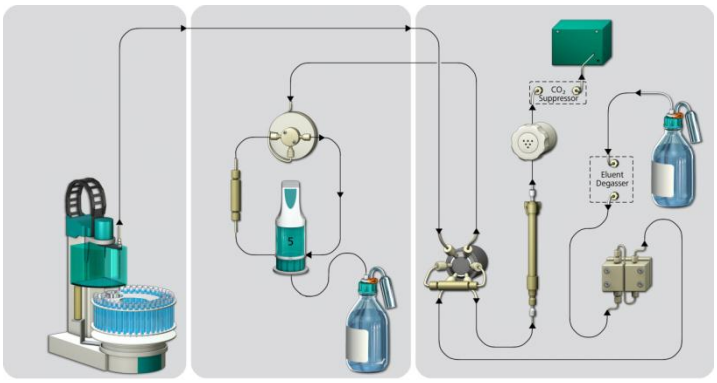
850 Professional IC Anion – MCS	2.850.2030
IC Conductivity Detector	2.850.9010
858 Professional Sample Processor	2.858.0010
800 Dosino (liquid handling)	2.800.0010
849 Level Control for Inline Eluent Preparation	2.849.1030

Calibration MiPCT

Calibration range	Factor of 100
Standard solution:	
Fluoride	5.0 µg/L
All other ions	10.0 µg/L
1. Level	0.05/0.1 µg/L = 20 µL
2. Level	0.1 /0.2 µg/L = 40 µL
3. Level	0.2 /0.4 µg/L = 80 µL
4. Level	0.5 /1.0 µg/L = 200 µL
5. Level	1.0 /2.0 µg/L = 400 µL
6. Level	2.5/ 5.0 µg/L = 1000 µL
7. Level	5.0/10.0 µg/L = 2000 µL



Flow chart



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