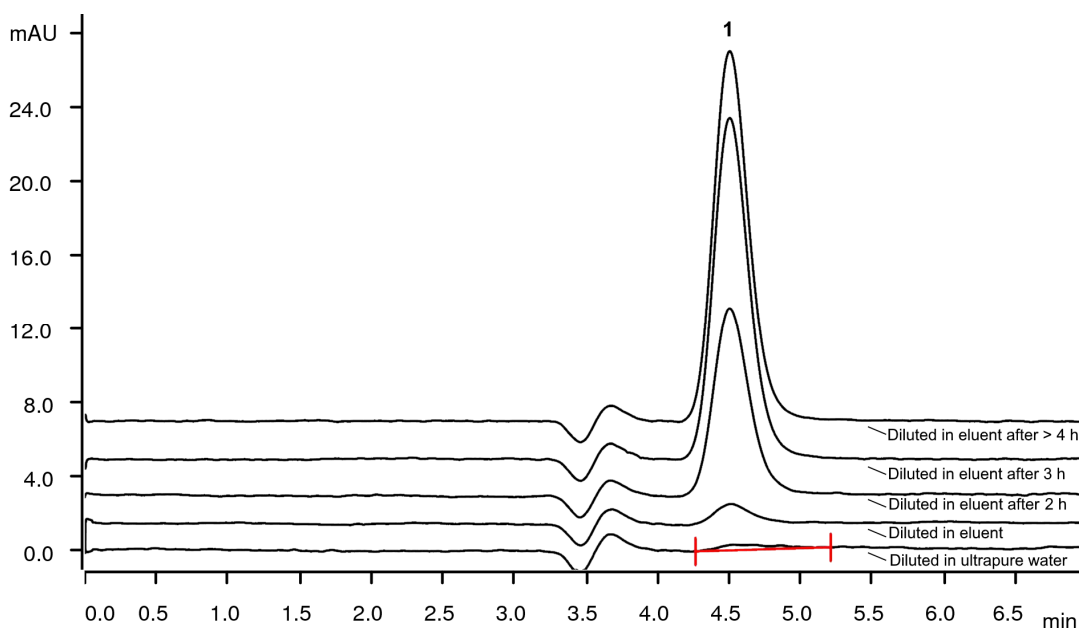


## IC Application Note U-078

# Silicate in cooling agents

### Analysis of silicate in cooling agents with UV/VIS detection after post-column reaction (PCR)



Chromatograms (with offset) of a cooling agent, diluted in ultrapure water (bottom trace) and eluent (upper traces) with an increase of the reaction time prior to analysis.

Scale formation is a critical issue in cooling systems leading to system damage, which generates enormous operational losses. One important component of scale forming is silica. Amorphous silica and metal silicates especially tend to build up scale. Therefore, it is crucial to know the silica concentration in cooling agents. By ion chromatography with UV/VIS detection and PCR, it is possible to determine both free and total silicate content. Sample dilution in ultrapure water and direct injection delivers the free silicate concentration. The total silicate content is determined after hydrolysis of amorphous silica by sample dilution in alkaline eluent, and injection after a reaction time (e.g. 4 hours) prior to the analysis.

## Results

Anion	Conc. direct [mg/L]
1 Silicate (UPW)	0.009
1 Silicate (eluent, direct)	0.051
1 Silicate (eluent, total, > 4h)	0.350

## Sample

Cooling agent.

## Sample preparation

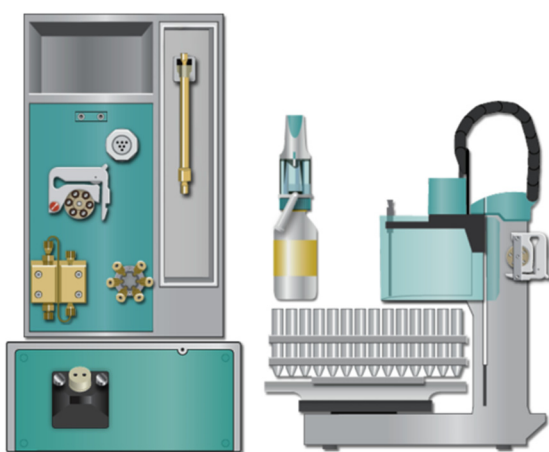
The sample is diluted 1:25 with ultrapure water or alkaline eluent, respectively.

## Columns

Metrosep A Supp 7 - 150/4.0	6.1006.620
Metrosep A Supp 5 Guard/4.0	6.1006.500

## Instrumentation

930 Compact IC Flex Oven/Deg	2.930.2560
947 Professional UV/VIS Detector Vario MW	2.947.0020
Halogen lamp (Vis) for Professional UV/VIS Detector	6.2804.100
Deuterium lamp (UV) for UV/VIS Detector Vario SW/MW	6.2804.110
858 Professional Sample Processor	2.858.0020
800 Dosino	2.800.0010
IC equipment: PCR with dosing unit	6.5330.400
Reactor complete	6.2845.200



## Solutions

Eluent	3.6 mmol/L sodium carbonate
Regenerant	100 mmol/L sulfuric acid
Suppressor rinsing	STREAM
Post-column reagent	200 mmol/L nitric acid 20 mmol/L sodium molybdate

## Analysis

UV/VIS detection after post-column reaction

## Parameters

Flow rate	0.7 mL/min
Injection volume	20 µL
P <sub>max</sub>	15 MPa
Column temperature	45 °C
Reactor temperature*	45 °C
UV lamp	On
VIS lamp	On
PCR flow	0.3 mL/min
Wavelength	410 ± 15 nm
Measuring duration	300 ms
Recording time	7 min

\* Reactor mounted in the column oven.

## Remark

Sequential suppression is applied as conductivity detection for standard ions was running in series. The non-suppressed setup is not tested on the actual samples, but it should work as well.

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