

Analysis of Anions using Chemical Suppressor

Introduction

ICSpak made by JASCO is a suppressor for anion chromatography. The packing material whose sulfonic acid group is chemically bonded to styrene-divinylbenzene porous polymer is packed in the PEEK tube. Using this suppressor at anion chromatography, the background of eluent decreases, and the sample changes to ion-pair with high equivalent conductivity. This suppressor can be used repeatedly by recycling and washing.

The more sensitive detection of nitrate ion and nitrite ion is enabled by using the UV detector, which is shown in this report using inert system and ICSpak.

Keyword: Chemical suppressor, anion, Shodex IC SI-90 4E, ICSpak, inert

Experimental

[Equipment]

Pump: PU-4080i
 Pump option: DG unit
 Autosampler: AS-4050i
 Column oven: CO-4060
 Detector: UV-4075 (Inert Cell)
 Shodex CD-5

[Conditions]

Column: Shodex IC SI-90 4E (4.6 mmI.D. x 250 mmL)
 Suppressor: ICSpak (4.6 mmI.D. x 100 mmL)
 Eluent: 1.8 mM Na₂CO₃ + 1.7 mM NaHCO₃
 Flow rate: 1.0 mL/min
 Column temp.: 25°C
 Wave length: 215 nm
 Injection volume: 100 µL
 Standard sample: Anion Mixture (Described below)

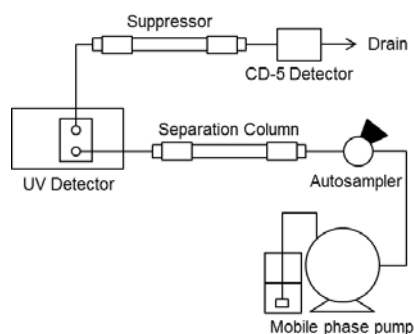


Fig. 1 The flow path diagram

Table 1 The concentration of anion standard solution mixture

Anions	Conc. [mg/L]
F ⁻	0.2
Cl ⁻	0.3
NO ₂ ⁻	0.5
Br ⁻	1
NO ₃ ⁻	1
PO ₄ ³⁻	1.5
SO ₄ ²⁻	1.5

Results

Fig. 2 shows the chromatograms of the anion standard solution mixture. 7-component anions are detected.

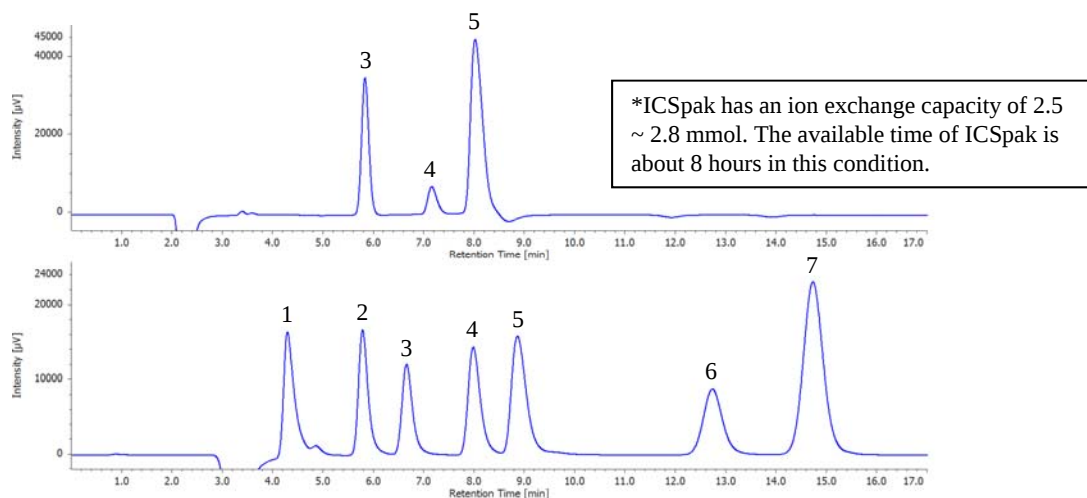


Fig. 2 The chromatograms of anion standard solution mixture using Shodex IC SI-90 4E and the chemical suppressor ICSpak

Top: UV detector, Bottom: electrical conductivity detector

1: F⁻, 2: Cl⁻, 3: NO₂⁻, 4: Br⁻, 5: NO₃⁻, 6: PO₄³⁻, SO₄²⁻

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Table 2 shows the detection lower limited values of anions.

Table 2 The detection lower limited values of anions

Anions	Concentration [mg/L]	Injection volume [ng]	UV	CD-5
			S/N=3 [$\mu\text{g/L}$]	S/N=3 [$\mu\text{g/L}$]
NO_2^-	0.5	50	0.89	1.46
Br^-	1	100	8.39	1.50
NO_3^-	1	100	1.33	1.34
F^-	0.2	20		0.32
Cl^-	0.3	30		0.40
PO_4^{3-}	1.5	150		3.67
SO_4^{2-}	1.5	150		1.45

The CO-4065 can equip up to two optional valves. Analysis and regenerating/washing can be performed in parallel by using the CO-4065 which mounts two 2 position/6 port switching valves and is connected two ICSpaks and a regenerating/washing pump (e.g., the PU-4180 which equips a low-pressure gradient unit) as shown in the Fig. 3.

[Equipment]

Pump: PU-4180
Pump option: DG unit
LPG unit
R-Pump unit: R-PU-4080i
Autosampler: AS-4050i
Column oven: CO-4065
Oven option: 2 way 6 port x 2
Detector: UV-4075 (Inert Cell)
Shodex CD-5

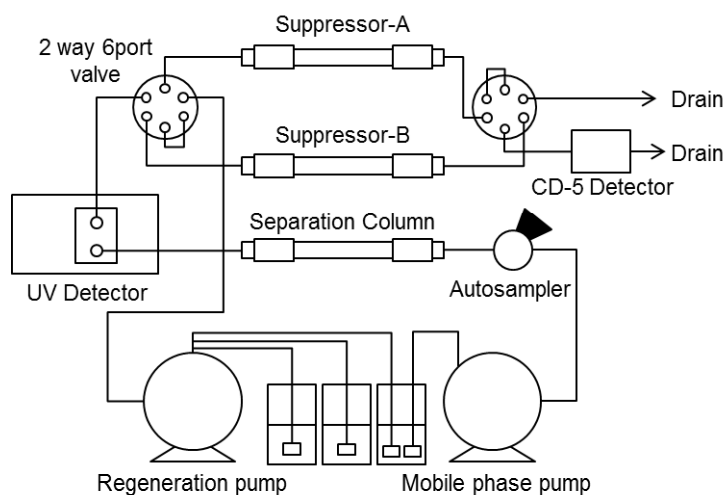


Fig. 3 The flow path diagram of the system which can perform analysis and regenerating/washing in parallel



Application Note

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The system of page 1

P/N	Description
	PU-4180i
7006-H003A	DG-4000-04 4-channel Degasser Unit, for Analytical
7018-J002A	AS-4050i Inert Autosampler
7021-J002A	CO-4060 Column Oven
7026-J002A	UV-4075 UV/VIS detector
7025-H136A	UV-4000 Inert flow cell unit
	CD-200
7058-J011A	BS-4000-1 Bottle stand
	Shodex IC SI-90 4E
	ICSpak Suppressor
6688-H564A	3x LC-Net CG cable
7059-J012A	ChromNAV Ver.2 Chromatography Data System
7001-H402A	HPLC PEEK Start Up Kit for LC-4000
7001-H405A	Maintenance tool kit

CD-200 was used to detect electrical conductivity because CD-5 is not available currently.

The system of page 2

P/N	Description
7002-J004A	PU-4180 RHPLC Pump (Base Unit)
7006-H003A	DG-4000-04 4-channel Degasser Unit, for Analytical
7007-H002A	LG-4080 Low Pressure Gradient Unit, w/o Tera mixer
7012-J002A	R-PU-4080i Right Extension Pump Unit (PU-4080i)
7018-J002A	AS-4050i Inert Autosampler
7023-J002A	CO-4065 Column Oven, Valve mountable model
	2x 2 way 6 port
7026-J002A	UV-4075 UV/VIS detector
7025-H136A	UV-4000 Inert flow cell unit
	CD-200
7058-J011A	BS-4000-1 Bottle stand
	Shodex IC SI-90 4E
	ICSpak Suppressor
6688-H564A	3x LC-Net CG cable
7059-J012A	ChromNAV Ver.2 Chromatography Data System
7001-H402A	HPLC PEEK Start Up Kit for LC-4000
7001-H405A	Maintenance tool kit

CD-200 was used to detect electrical conductivity because CD-5 is not available currently.

The optional valve of the CO-4065 is a special order product as of November 12th, 2014.

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