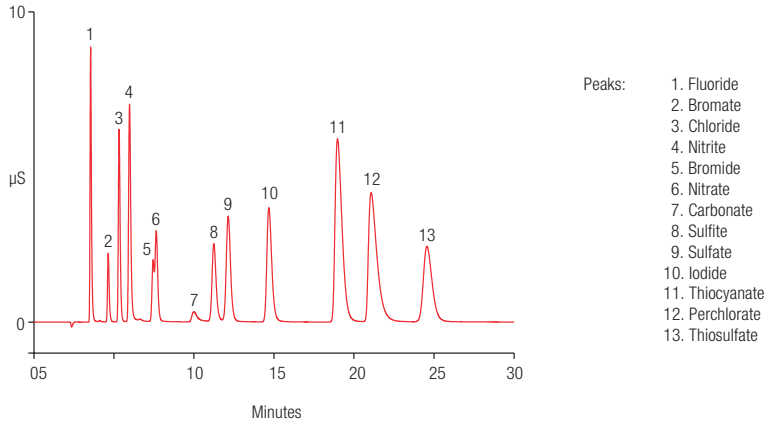
Ion chromatography

Thermo Scientific Dionex IonPac AS25 Anion-Exchange Column

The Thermo Scientific™ Dionex™ IonPac™ AS25 Anion-exchange Column is a high-capacity, hydroxide-selective, anion-exchange column optimized for the separation of multivalent anions and polarizable anions (perchlorate), including sulfur speciation (sulfite, sulfate, thiocyanate and thiosulfate). Using an isocratic hydroxide eluent, these analytes can be determined in approximately 25 minutes without the use of solvent. The Dionex IonPac AS25 column is ideal for the determination of sulfur species in wastewater effluents from industrial, chemical and petrochemical industries as well as food and beverage samples. The Dionex IonPac AS25 column is available in 2 × 250 mm and 4 × 250 mm formats, supporting flow rates from 0.25 to 3 mL/min.

Isocratic Separation of Sulfur Species and Inorganic Anions Using the Dionex IonPac AS25 Column



Recommended for multivalent anions in diverse sample matrices

- Municipal wastewater
- Food processing samples
- Paper and pulp effluents
- Refinery waste products
- Industrial wastewaters
- Industrial scrubber solutions
- Geothermal power plant samples

Superior chromatographic performance

- Optimized hydrophilic resin for the gradient separation of multivalent anions and polarizable anions.
- Recommended for sulfur speciation in process effluents, wastewater and scrubber solutions.
- Use with an eluent generator for simplified Thermo Scientific™ Dionex™ Reagent-Free™ Ion Chromatography (RFIC™) System operation. Requires only a deionized water source to produce hydroxide eluent.
- Eluent suppression using the Thermo Scientific Dionex ASRS™ 300 Anion Self-Regenerating Suppressor™ provides RFIC system operation with low backgrounds and enhanced analyte sensitivity.
- High capacity: 350 µeq per column (4 × 250 mm column).
- Compatible with organic solvents to enhance analyte solubility, modify column selectivity, and effectively clean the column.
- The microbore format requires less eluent consumption, thereby reducing operating costs.

High-efficiency particle structure

The Dionex IonPac AS25 column was developed using a unique polymer bonding technology. The stationary phase consists of a novel, hyperbranched, anion-exchange condensation polymer electrostatically attached to the surface of a wide-pore polymeric substrate. The substrate is surface-sulfonated in exactly the same manner as Thermo Scientific Dionex latex-coated, anion-exchange materials. However, in this anion-exchange resin, alternating treatments of epoxy monomer and amines produce a coating that grows directly off the substrate surface, as illustrated in Figure 1. Resin capacity is controlled through the number of alternating coating cycles. The resulting polymer is extremely hydrophilic and, therefore, has excellent selectivity for hydroxide eluents, allowing the use of lower eluent concentrations. The Dionex IonPac AS25 column uses a high-capacity resin with optimized selectivity for sulfur speciation in complex matrices.

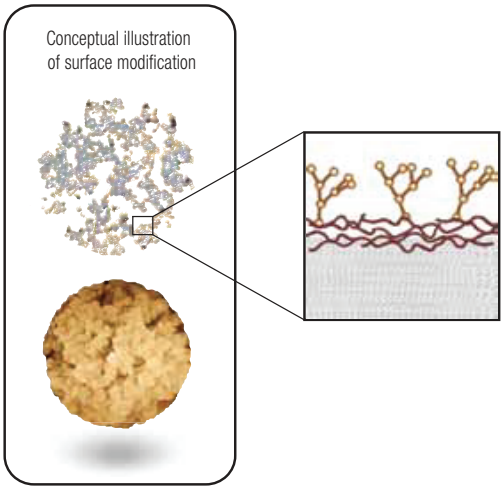
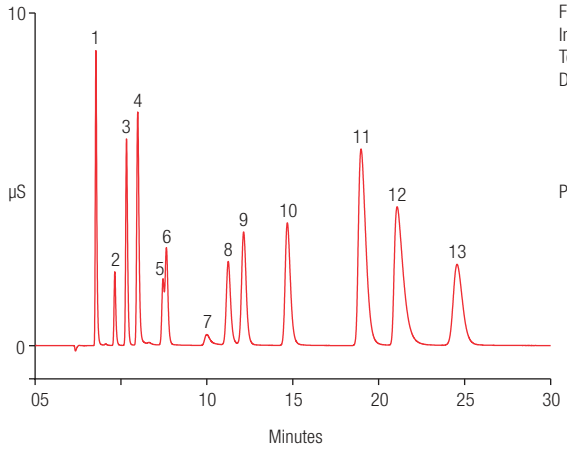


Figure 1. Structure of a Dionex IonPac AS25 packing particle.

Isocratic separation of multivalent and polarizable anions

Sulfur-containing inorganic anions are commonly encountered in soil sediments, hot springs, and lake waters. They are also frequently encountered in many industrial settings, such as the monitoring of process liquors and wastewaters from paper mills, mining sites, off-shore oil drilling operations, and alkaline scrubber solutions, and in the analysis of foods and beverages. Due to their redox chemistry, many sulfur-containing species can readily react with each other, decompose over time, or be oxidized in the presence of air. They are also very sensitive to the solution pH, which would affect the distribution of the species over time. All these make the determination of the sulfur-containing species a very challenging task.



Column:	Dionex IonPac AS25, 4 mm
Eluent:	37 mM KOH
Eluent Source:	Dionex EGC III KOH
Flow Rate:	1 mL/min
Inj. Volume:	25 µL
Temperature:	30 °C
Detection:	Suppressed conductivity Dionex ASRS 300, 4 mm, AutoSuppression™, recycle mode

Peaks:
1. Fluoride
2. Bromate
3. Chloride
4. Nitrite
5. Bromide
6. Nitrate
7. Carbonate
8. Sulfite
9. Sulfate
10. Iodide
11. Thiocyanate
12. Perchlorate
13. Thiosulfate

Figure 2. Isocratic separation of sulfur species and inorganic anions using a hydroxide eluent on the 4 mm Dionex IonPac AS25 column.

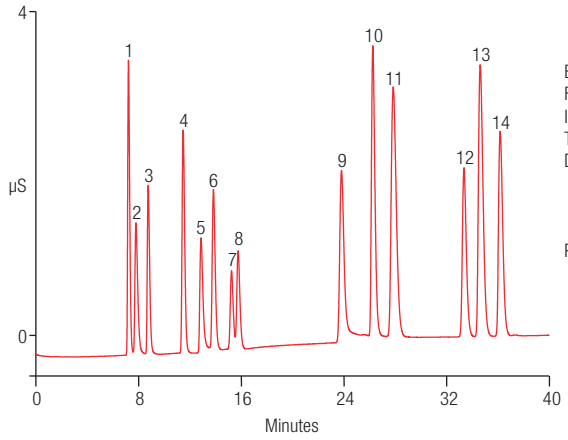
The Dionex IonPac AS25 column has been optimized for the fast, isocratic determination of multivalent and polarizable anions such as thiosulfate, iodide, thiocyanate, and perchlorate in less than 25 minutes without the use of solvent, as shown in Figure 2.

For the best peak shape of polarizable anions, including perchlorate, the Thermo Scientific™ Dionex™ IonPac™ AS16 or the Thermo Scientific™ Dionex™ IonPac™ AS20 columns are recommended.

Gradient separations as simple as isocratic runs with eluent generation

An eluent generator produces high purity potassium hydroxide eluent electrolytically from water, eliminating the need for eluent preparation. The hydroxide eluent produced is free of carbonate contamination. The use of carbonate-free hydroxide eluents results in minimal baseline shifts during hydroxide gradients yielding lower background conductivities and lower detection limits for target analytes.

Figure 3 shows the separation of common anions and polarizable anions using the Dionex IonPac AS25 4 mm column and gradient elution. No solvent is required to achieve the separation of these highly polarizable anions in less than 37 minutes.



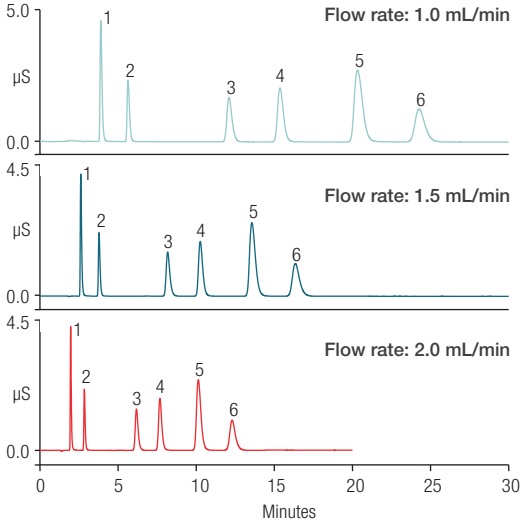
Columns:	Dionex IonPac AG25, AS25, 4 mm
Eluent:	Potassium Hydroxide: 5–15 mM from 0 to 10 min, 15–30 mM from 10 to 20 min, 30–60 mM from 20 to 38 mi
Eluent Source:	Dionex EGC III KOH
Flow Rate:	1 mL/min
Inj. Volume:	10 µL
Temperature:	30 °C
Detection:	Suppressed conductivity Dionex ASRS 300, 4 mm, AutoSuppression, recycle mode

Peaks:		
	1. Fluoride	8. Bromide
	2. Acetate	9. Iodide
	3. Formate	10. Sulfate
	4. Chloride	11. Thiocyanate
	5. Nitrite	12. Thiosulfate
	6. Chlorate	13. Chromate
	7. Nitrate	14. Phosphate

Figure 3. Separation of common anions and polarizable anions using the Dionex IonPac AS25 column with gradient elution.

Fast analysis using the Dionex IonPac AS25 column

The Dionex IonPac AS25 column is a high capacity column, 350 µeq/column for the 4 mm column, which allows for the analysis of complex sample matrices and generally produces longer run times. However, by increasing the flow rate, polarizable anions can be resolved isocratically in less than 13 minutes as shown in Figure 4.



Columns:	Dionex IonPac AG25, AS25, 4 mm
Eluent:	36 mM KOH
Eluent Source:	Dionex EGC III KOH
Flow Rate:	See chromatogram
Inj. Volume:	10 µL
Temperature:	30 °C
Detection:	Suppressed conductivity Dionex ASRS 300, 4 mm, AutoSuppression, recycle mode

Peaks:		
	1. Fluoride	2 mg/L
	2. Chloride	3
	3. Sulfate	5
	4. Thiosulfate	10
	5. Iodide	20
	6. Thiocyanate	20

Figure 4. Fast analysis using the Dionex IonPac AS25 column with increased flow rates.

Determination of sulfur species in wastewater samples

The high capacity of the Dionex IonPac AS25 column makes it ideal for the analysis of sulfur species in wastewater samples. Figure 5 shows the analysis of a wastewater sample containing common anions, including phosphate, with a run time of less than 30 minutes. The column produces excellent resolution of carbonate from sulfate. The Sample B chromatogram in Figure 5 shows the wastewater spiked with sulfite and thiosulfate. With an optimized hydroxide gradient, these species can easily be determined in less than 30 minutes.

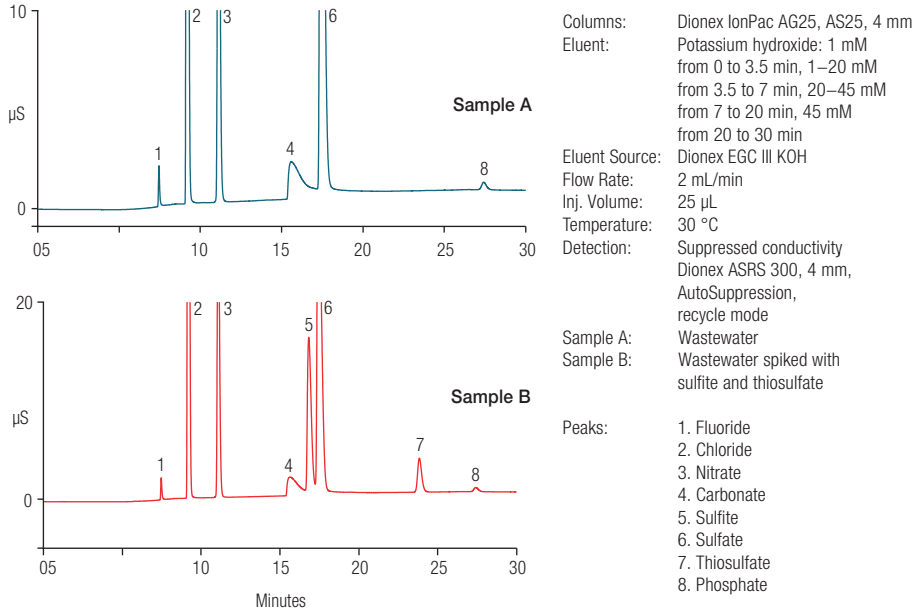


Figure 5. Determination of inorganic anions and sulfur species in wastewater samples using the Dionex IonPac AS25 column.

Analysis of gas scrubber solutions

Acid gases such as hydrochloric acid (HCl), hydrofluoric acid (HF), phosgene ($COCl_2$), chlorine (Cl_2), and hydrogen sulfide (H_2S) are removed from caustic scrubbers in industrial processes. The purpose of the caustic scrubber is to prevent exposure of the acid gases to the environment. Effectiveness of these scrubbers are established by frequent analysis. Figure 6 shows the application of the analysis of a simulated acid-gas scrubber sample consisting of 3% base. The sample was diluted 10-fold in the above application. For higher concentration of scrubber solutions, a Thermo Scientific™ Dionex™ ASRN™ 300 Neutralizer can be used to neutralize the alkaline samples.

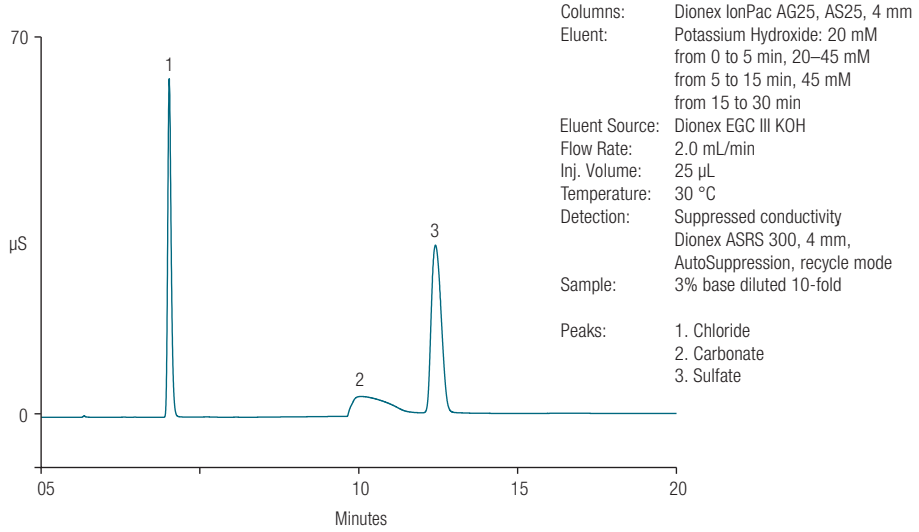
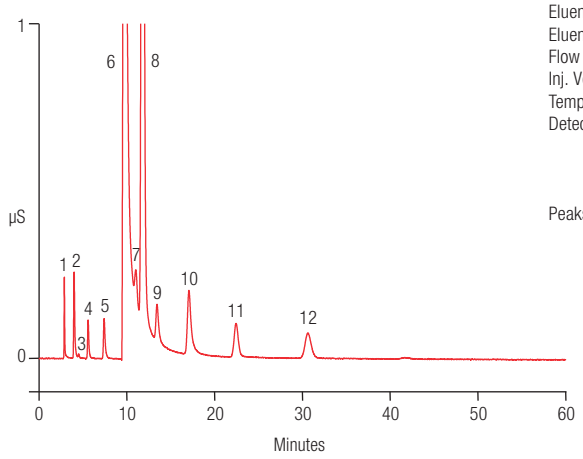


Figure 6. Sulfur species analysis of a simulated acid-gas scrubber solution using the Dionex IonPac AS25 column.

Analysis of volcanic gas samples

Gases that are released from volcanic vents are collected and analyzed for sulfur-containing species and polarizable anions. The gases are collected in a concentrated sodium hydroxide solution having high levels of carbonate and sulfate present. Figure 7 shows the analysis of a simulated sample of volcanic gas condensate on the Dionex IonPac AS25 column. The sample was spiked with fluoride, chloride, bromide, sulfite, iodide, thiocyanate, thiosulfate and phosphate, which are eluted isocratically in approximately 30 minutes.



Columns:	Dionex IonPac AG25, AS25, 2 mm
Eluent:	37 mM KOH
Eluent Source:	Dionex EGC III KOH Cartridge
Flow Rate:	0.25 mL/min
Inj. Volume:	6 µL
Temperature:	30 °C
Detection:	Suppressed conductivity Dionex ASRS 300, 2 mm, AutoSuppression, recycle mode

Peaks:		
	1. Unknown	7. Sulfite
	2. Fluoride	8. Sulfate
	3. Unknown	9. Iodide
	4. Chloride	10. Thiocyanate
	5. Bromide	11. Thiosulfate
	6. Carbonate	12. Phosphate

Figure 7. Simulated sample of volcanic gas condensate separated using the Dionex IonPac AS25 column.

System recommendations

The Dionex IonPac AS25 column is recommended for use with Dionex RFIC systems equipped with an eluent generator. The Dionex IonPac AS25 can also be used with older Dionex IC systems equipped with an eluent generator or a Thermo Scientific™ Dionex™ RFC-30 Reagent-Free Controller. The eluent generator is used to automatically produce potassium hydroxide gradients from deionized water.

Suppressor recommendation

For optimum ease-of-use and performance, the Dionex IonPac AS25 column should be used with the Dionex ASRS 300 supressor. Operate the Dionex IonPac AS25 column at an elevated temperature (30 °C) to ensure reproducible retention times.

Anion trap columns

When using an eluent generator for eluent delivery, a Thermo Scientific™ Dionex™ CR-ATC Continuously Regenerated Anion Trap Column should be installed between the eluent generator cartridge and the degas module. As an alternative for 4 mm and 2 mm systems, a Thermo Scientific™ Dionex™ ATC-HC Column can be installed between the pump outlet and inlet of the eluent generator cartridge. Alternatively, when using a manually prepared sodium hydroxide gradient with the Dionex IonPac AS25, the Thermo Scientific™ Dionex™ ATC-3 Anion Trap Column should be installed between the gradient pump and the injection valve to remove anionic contaminants from the eluent.

Concentrator columns

For concentrator work with a 2 mm or 4 mm Dionex IonPac AS25 column, use the: Thermo Scientific™ Dionex™ IonPac™ AG25 Guard Column; Thermo Scientific™ Dionex™ Ultratrace Anion Concentrator Column (UTAC-ULP1, UTAC –XLP1, UTAC-ULP2, or UTAC-XLP2); or Thermo Scientific™ Dionex™ Trace Anion Concentrator Column (TAC-ULP1) when a single-piston pump, e.g., the Thermo Scientific™ Dionex™ AXP Pump (pulse damper required), is used for sample delivery. In addition to the concentrator columns listed above, use the Thermo Scientific™ Dionex™ UTACLP1, UTAC-LP2 or TAC-LP1 Columns when the sample is delivered with a syringe or with a low-pressure autosampler, e.g., the Thermo Scientific™ Dionex™ AS-DV Autosampler.

Specifications	
Dimensions	Dionex IonPac AS25 Analytical Columns: 2 × 250 mm and 4 × 250 mm
	Dionex IonPac AG25 Guard Columns: 2 × 50 mm and 4 × 50 mm
Maximum operating pressure	3,000 psi (Standard and Microbore)
Mobile phase compatibility	pH 0–14; 0–100% HPLC solvents
Substrate characteristics	**Analytical column:** Supermacroporous Resin Bead Diameter (µm): 7.5 Pore Size: 2000 Å Cross-Linking (%DVB): 55%
	Guard column: Microporous Resin Bead Diameter (µm): 13.0 Pore Size: <10 Å Cross-Linking (%DVB): 55%
Ion-exchange Group	Functional group: Alkanol quaternary ammonium ion
	Hydrophobicity: Ultralow
Capacity	87.5 µeq (2 × 250 mm)
	0.875 µeq* (2 × 50 mm)
	350 µeq (4 × 250 mm)
	3.5 µeq* (4 × 50 mm)
Column construction	PEEK™ with 10–32 threaded ferrule style end fittings
	All components are nonmetallic

* Guards are packed with a low capacity microporous resin.

Ordering information

To order in the U.S., call 1-800-346-6390, or contact the Thermo Fisher Scientific office nearest you. Outside the U.S., order through your local Thermo Fisher Scientific office or distributor. Refer to the following part numbers.

Description	Part number
Dionex IonPac CS17 Columns	
Dionex IonPac AS25 Analytical Column (4 × 250 mm)	076014
Dionex IonPac AG25 Guard Column (4 × 50 mm)	076015
Dionex IonPac AS25 Analytical Column (2 × 250 mm)	076016
Dionex IonPac AG25 Guard Column (2 × 50 mm)	076017
Trap columns	
Dionex CR-ATC Continuously Regenerated Anion Trap Column (for use with systems equipped with an eluent generator or the Dionex RFC-30 Reagent-Free Controller)	060477
Dionex ATC-3 Anion Trap Column (9 × 24 mm) (for use with 4 mm columns)	059660
Dionex ATC-3 Anion Trap Column (4 × 35 mm) (for use with 2 mm columns)	059661
Dionex ATC-HC Anion Trap Column (for use with an eluent generator)	059604
Trace Anion Concentrator Columns	
Dionex TAC-LP1 Trace Anion Concentrator (4 × 35 mm)	046026
Dionex TAC-ULP1 Trace Anion Concentrator (5 × 23 mm)	061400
Dionex UTAC-LP1 Ultratrace Anion Concentrator Low Pressure (4 × 35 mm)	063079
Dionex UTAC-ULP1 Ultratrace Anion Concentrator Ultra Low Pressure (5 × 23 mm)	063475
Dionex UTAC-XLP1 Ultratrace Anion Concentrator Extremely Low Pressure (6 × 16 mm)	063459
Dionex UTAC-LP2 Ultratrace Anion Concentrator Low Pressure (4 × 35 mm)	072779
Dionex UTAC-ULP2 Ultratrace Anion Concentrator Ultra Low Pressure (5 × 23 mm)	072780
Dionex UTAC-XLP2 Ultratrace Anion Concentrator Extremely Low Pressure (6 × 16 mm)	072781

Learn more at **thermofisher.com/ic**