

Anion and Cation Spectrometer



AI Overview

Anion and cation spectrometers are analytical instruments used to separate, detect, and quantify negatively and positively charged ions in a sample, often employing ion chromatography, mass spectrometry, or spectrophotometry.

Principles of Operation

Anion and cation spectrometers typically rely on ion-exchange chromatography to separate ions based on their charge and size. A sample is introduced into a mobile phase (eluent) and passed through an ion-exchange column, where ions interact with the stationary phase. After separation, ions are detected using techniques such as conductivity detection, UV-VIS spectrophotometry, or mass spectrometry (MS), providing both qualitative and quantitative information.

Detection Techniques

- Ion Chromatography-Mass Spectrometry (IC-MS):** Combines ion separation with mass-selective detection, allowing highly sensitive and selective analysis of both inorganic and organic ions. IC-MS can detect trace levels of anions like fluoride, nitrate, chloride, sulfate, and phosphate, as well as organic acids, with improved detection limits and reduced matrix interference.
- UV-VIS Spectrophotometry:** Measures the absorbance of light by ions at specific wavelengths. This method is commonly used for anions such as phosphates and nitrates in water samples, where absorbance is correlated to concentration using Beer's law.

Applications

- Environmental Monitoring:** Quantification of anions and cations in water, wastewater, and soil to assess pollution or nutrient levels.
- Industrial Quality Control:** Analysis of ultrapure water, solvents, and chemicals in semiconductor manufacturing or pharmaceutical production to ensure minimal ionic contamination.
- Battery Electrolytes:** Studying cation-cation, anion-anion, and cation-anion correlations in lithium-ion battery electrolytes to understand ion transport and improve performance.

Sample Preparation and Automation

Modern systems often include inline sample preparation techniques such as ultrafiltration or dialysis to remove interfering subst...

Article Content

Time-of-flight mass analyser for anion mass spectrometry and anion ...

The ion optical design and characteristic features of a time-of-flight mass analyser for anion mass spectrometry and, in particular, for anion photoelectron and anion zero kinetic energy

Mass Spectrometry

Mass spectrometry only measures the mass of charged particles (i.e., ions). Neutral compounds are effectively invisible, but cations (positively charged) and anions (negatively charged) are “seen”

Benchmark Ditopic Binding of Cl

The ion-pair complex $\text{Cl}^- \cdot \text{C}_{18}\text{C}_6\text{Cs}^+$ is predicted to host the cation and anion on opposite sides of the macrocycle in a C_{3v} conformation that does not correlate with the lowest energy structures of the

Analysis of Anions and Oxoanions using Ion Chromatography Mass ...

Summary Ion Chromatography Mass Spectrometry (IC-MS) is a powerful tool to handle many challenging analytical tasks.

Combining ion chromatography with mass spectrometry

Zhu and co-authors selectively determined perchlorate, nitrate, and thiocyanate in human urine combining anion-exchange chromatography with triple quadrupole

6.10: Fragmentation

Some Common Ions There are a number of ions commonly seen in mass spectrometry that tell you a little bit about the structure. Just like with anions,

Mass Spectrometry

The molecular ion is a radical cation, but the fragment ions may either be radical cations (pink) or carbocations (orange), depending on the nature of the neutral

Ion chromatography

The two types of ion chromatography are anion-exchange and cation-exchange. Cation-exchange chromatography is used when the molecule of interest is

A Beginner's Guide to Mass Spectrometry: Types of

Mass spectrometry is a powerful analytical tool that enables scientists to identify and quantify molecules with remarkable precision. At the

The Competition Between Cation-Anion and Cation

Based on earlier studies on pure ILs, we hoped to obtain important structural information about how the individual components (cation, anion and

Anion-Cation-Anion Ion Triplet Characterization by

Ion triplets of the chloride salts of two commonly used weakly coordinating cations are reported (i.e., $\text{Cl}^- \cdot \text{NMe}_4^+ \cdot \text{Cl}^-$ (1-) and $\text{Cl}^- \cdot \text{PPh}_4^+ \cdot \text{Cl}^-$

Time-resolved terahertz-Raman spectroscopy reveals that cations

Article Open access Published: 30 June 2022 Time-resolved terahertz-Raman spectroscopy reveals that cations and anions distinctly modify intermolecular interactions of water

Analysis of Anions by Spectrophotometry

Often, to assess water quality, anions such as nitrates and phosphates need to be quantitatively determined at concentrations in the parts per million (ppm) range

Ion Chromatography Coupled with Mass Spectrometry for Metabolomics

Reversed-phase, HILIC, and anion-exchange chromatography were used with high-resolution MS to investigate the metabolic profile of biological samples. The classes of compounds identified with

Detection of Common Inorganic Anions Using a Compact Ion

Introduction This application brief describes a method for detecting seven common anions using a Thermo Scientific™ Dionex™ Integriion™ HPICTM system coupled to a Thermo Scientific™

Molecular chemosensors for hazardous anions (AcO^- , CN^- and F^- ...

Counter cations play a significant role in the behavior and performance of chemosensors for anion detection. They can influence the solubility, binding affinity, and selectivity of the sensor

Metabolomics using anion-exchange chromatography mass ...

Here, we provide step-by-step instructions for both untargeted and semi-targeted metabolite analysis from cell, tissue or biofluid samples by using anion-exchange

Metabolomics using anion-exchange chromatography mass spectrometry

Elution occurs by charge-exchange using high-ion strength mobile phase ions: typically, a gradient of hydroxide ions (for anion exchange) or protons (for cation exchange).

Quantification of cation-cation, anion-anion and

Directional correlations between the movements of cations and anions exert a strong influence on the charge and mass transport properties of concentrated

Analysis of Inorganic Anions Using HILIC Chromatography and

HILIC is a robust and reliable analysis, which can be easily implemented in a laboratory where reversed-phase chromatography is already routinely used.¹ With its recent advancements, HILIC offers an

Structure, Anion, and Solvent Effects on Cation

The abundance of an ion in an electrospray ionization mass spectrum is dependent on many factors beyond just solution concentration. Even in cases

Mass spectrometry of anions and cations produced in 1–4

Interactions between 1 and 4 keV anions (H^- , O^- , and OH^-) and gas-phase molecules (nitromethane, water, ethanol, and methanol) have been studied using quadrupole mass

Simultaneous separation and detection of anions and cations in ion ...

The detection system consisted of an anion suppressor and a cation suppressor connected in parallel, combined with a switching valve to allow each detector to be selected as

IC-MS: Ion Chromatography–Mass Spectrometry

IC-MS is a modern analytical technique performed with an ion chromatograph and a mass spectrometer, IC and MS, which are connected (hyphenated) together in series (Figure 1). Each of

An introduction to ion chromatography mass spectrometry (IC-MS)

An introduction to ion chromatography mass spectrometry (IC-MS) Ion chromatography mass spectrometry (IC-MS) is a powerful tool that can handle many challenging analytical tasks which

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