Monovalent Cations in Explosives

INTRODUCTION

Isocratic elution is used to separate the common monovalent cations [sodium, ammonia, monomethylamine (MMA), and potassium] in ammonium nitrate-based inorganic explosives. Divalent cations in the sample will be retained on the column. Minimum detection limits range from about 50 ppb for sodium to about 100 ppb for monomethylamine in a 50-µL injection. The working range of concentrations extends to about 40 ppm for each cation.

The low detection limits make this a quick, direct method for the analysis of bomb residues in criminal investigations. For quality control in explosives manufacturing, a simple dilution of the sample in deionized water is the only sample preparation required.

APPLICATION AREAS

- Explosives manufacturing
- Military quality control
- Forensic investigations

CONDITIONS

Sample Loop Volume:	50 µL
Columns:	IonPac® CS3 Analytical IonPac CG3 Guard
Eluent:	25 mM HCl, 0.1 mM DAP•HCl 4% Acetonitrile
Eluent Flow Rate:	1.0 mL/min
Suppressor:	Cation MicroMembrane™ Suppressor (CMMS)
Regenerant:	100 mM Tetrabutylammonium Hydroxide
Regenerant Flow Rate:	10 mL/min using AutoRegen® Accessory
Detector:	Conductivity, 30 µS full scale
Injection Volume:	50 µL

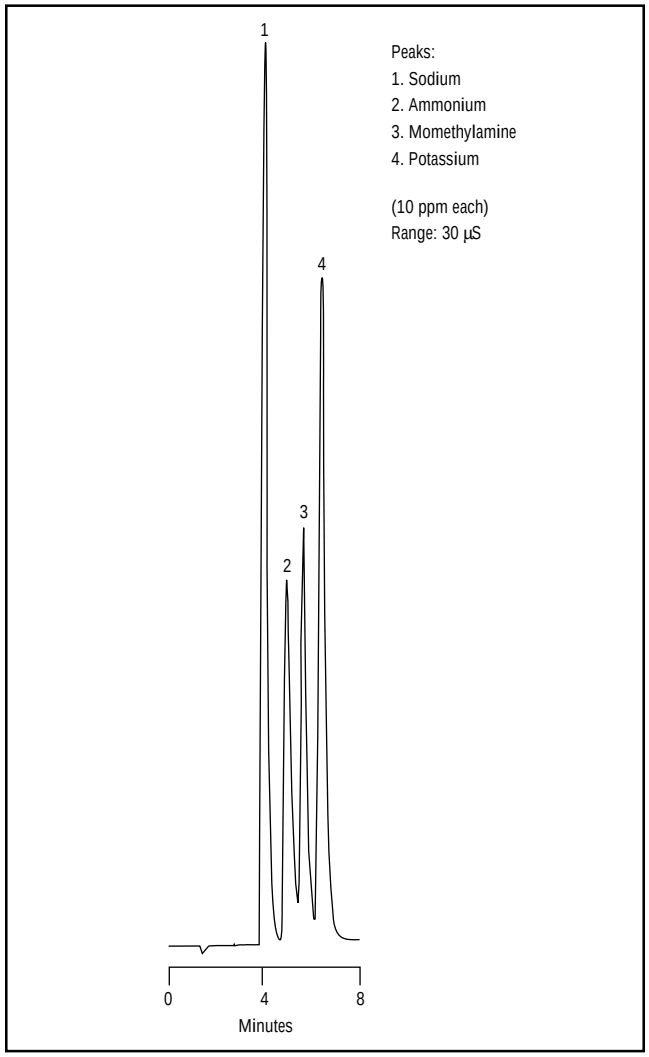

Figure 1. Common monovalent cations in inorganic explosives

PREPARATION OF SOLUTIONS AND REAGENTS

Eluent: 25 mM HCl, 0.1 DAP•HCl 4% Acetonitrile

Dissolve 0.14 g of DAP•HCl (diaminopropionic acid monohydrochloride), 25 mL of 1 M HCl stock solution and 40 mL of acetonitrile in deionized water to 1.0 L.

Regenerant: 100 mM Tetrabutylammonium Hydroxide

Dilute 200 mL of 55% TBAOH (tetrabutylammonium hydroxide) to 4 L with deionized water.

EQUIPMENT

Dionex ion chromatograph equipped with a conductivity detector.

NOTE

Small disturbances in the baseline may be due to the elution of divalent cations. Divalent cations may be cleaned from the column with an eluent consisting of 0.5 M HCl, 0.1 mM DAP•HCl. After cleaning the column with this eluent for 15 minutes, re-equilibrate the column with the recommended eluent for this application for at least 15 minutes.

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