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Application Note

# Determination of Nitroaromatics and Nitramines by High Performance Liquid Chromatography (Explosives)

Waters Corporation


This is an Application Brief and does not contain a detailed Experimental section.

## Abstract

This application note describes EPA Method 8330.0 determination of nitroaromatics and nitramines by high performance liquid chromatography (HPLC).

## Introduction

The presence of numerous military and defense sites around the world, both active and decommissioned, has resulted in the presence of explosives compounds in locations where they can enter the water supply. In the US, the evaluation of sites for potential contamination is carried out by the United States Environmental Protection Agency (US EPA), US Department of Defense, and US Department of Energy in support of Superfund, RCRA, and Base Closure environmental programs.

# Experimental

## HPLC Conditions

| | |
|---|---|
| Instrument: | Waters Alliance HPLC system with 2487 Dual λ Absorbance detector |
| Eluent: | 10 mM ammonium formate/isopropanol |
| Column: | XTerra Phenyl, 3.5 µm, 2.1 x 150 mm @ 40 °C |
| Injection: | 10 µL of standard |
| Flow rate: | 0.25 mL/min |
| Detection: | UV @ 254 nm |
| Data: | Waters Empower software |

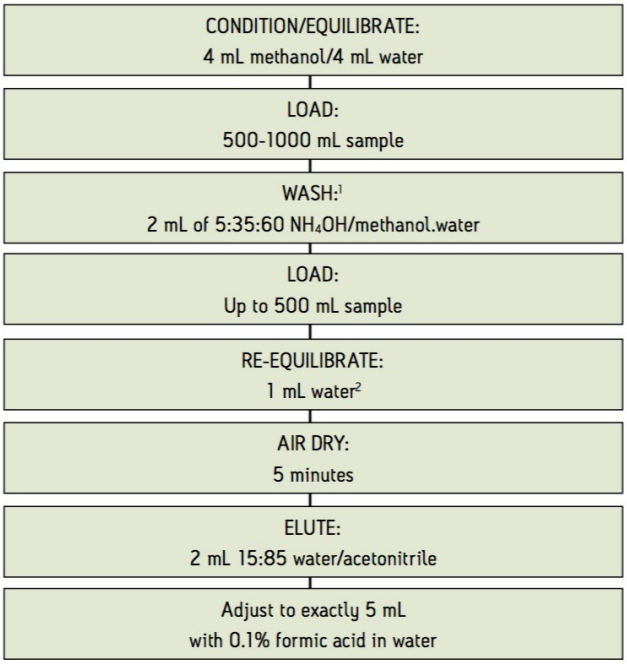
## Sample Preparation

| | |
|---|---|
| Sample Matrix: | Groundwater and surface water, low concentration |
| Sample Prep: | Solid-phase extraction using a 500 mL sample Porapak reverse-phase sorbent (RDX), elute with acetonitrile |

## Alternate Sample Preparation

Oasis HLB Extraction Method

Oasis HLB Extraction Cartridge, 6 cc, 200 mg




*1 This wash step will remove humic and other interferences.*

*2 Tetyl is unstable in base-this step removed $NH_4OH$ prior to elution.*

## Standard Preparation

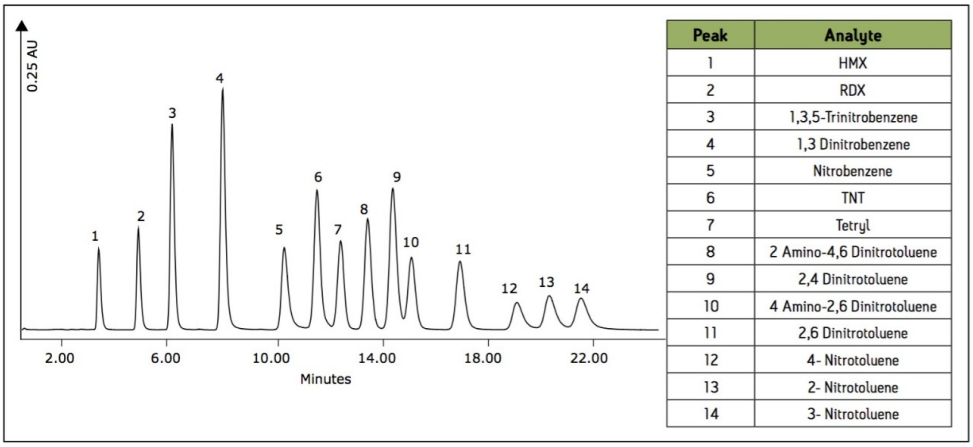
Dilute 100 µL of AccuStandard mix (M-8330-R) to 10 mL with eluent for a working 10 ppm standard mixture.

## Eluent Preparation

10 mM ammonium formate/isoprapanol

Dissolve 0.631 g of ammonium formate in 100 mL water. Transfer to a 1 L volumetric flask. Add 200 mL of Isopropanol. Dilute to the mark with water and mix well. Carefully pH to 3.8 with formic acid, then filter and degas.

## Results and Discussion




| Peak | Analyte |
|---|---|
| 1 | HMX |
| 2 | RDX |
| 3 | 1,3,5-Trinitrobenzene |
| 4 | 1,3 Dinitrobenzene |
| 5 | Nitrobenzene |
| 6 | TNT |
| 7 | Tetryl |
| 8 | 2 Amino-4,6 Dinitrotoluene |
| 9 | 2,4 Dinitrotoluene |
| 10 | 4 Amino-2,6 Dinitrotoluene |
| 11 | 2,6 Dinitrotoluene |
| 12 | 4- Nitrotoluene |
| 13 | 2- Nitrotoluene |
| 14 | 3- Nitrotoluene |

*Figure 1: Standard chromatogram, 10 ppm each analyte.*

## References


1. The Science of ACQUITY UPLC Applied to Environmental Analyses of PAHs and Explosives in Water 720001398EN
2. Explosives in River Water – Oasis Solution WA31764.82 An Improved Method for Determination of Nitroaromatic and Nitramine Explosives in Aqueous Samples WA20717
3. High Speed Explosives Monitoring using UPLC 720000950EN

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