Automated Solid Phase Extraction of Dioxins and Furans in Soil and Sediments

TurboVap® LV RapidTrace®

Figure 1. Instrumentation used for sample preparation. TurboVap® LV for automated sample evaporation. The RapidTrace® for automated SPE.

Introduction

EPA methods 8260 & 8270 cover the analysis of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans in ground & surface waters. This also now includes 1,4-dioxane and PCBs. This application note will focus on the automated SPE of the sample rather than the detection which usually involves GCMS or LCMS. NB The columns and reagents used for soils and sediment analysis differ to ground water extraction.

Soil and Sediment Sample Preparation

- A 10–20 g dry weight sample of soil or sediment needs to be mixed with several 20 mL volumes of Hexane : Acetone (90:10) to extract the organic compounds from the matrix. The resulting solvent then needs evaporation using a TurboVap to reduce the volume to approximately 1 mL. The Acetone will be lost by this stage so that the Dioxins and Furans in Hexane can be separated from the interferences to allow low detection limits.

- An ISOLUTE® NH2 500 mg/3 mL SPE column part number 470-0050-B is used to capture the interferences and allow the cleaned up Eluent to be collected. The Eluent can be passed through an anhydrous sodium sulphate cartridge to dry it or a layer of anhydrous sodium sulphate can now be incorporated in new SPE cartridges.

RapidTrace Method

All solvent lines are purged and primed with solvent first . A maximum of 8 solvents can be used to run a wide range of methods. The 4 independent waste solvent lines can be separated if needed. The instrument sample rack has two rows of 10 test tubes for holding the samples and fractions. If multiple fractions are collected from the same sample it will reduce the throughput. The sample preparation time for this dual fraction collection method is under 6 minutes and offers an automated rugged and reproducible solution for busy environmental laboratories.

Step	Source	Destination	Volume (mL)	Flow (mL/Sec)
Condition	Hexane	Organic Waste	5	15
Load	Sample	Fraction 1	1	1
Collect	Hexane	Fraction 1	2	1
Purge - Cannula	Hexane	Cannula Waste	2	30

Common Reagent Table for all Methods

Line No.	Reagent Name	SIP Speed (mL/min)
1	Hexane	30

Waste Name	Abbreviation	SIP Speed (mL/min)
Aqueous Waste	Aq W	Air Push = 2mL
Organic Waste	Org W	Air Push Multiplier = 2
Cannula Waste	Cannula	

Biotage®

Ordering Information

Part Number	Description	Quantity
C50000	RapidTrace®+ Workstation 1 mL and 3 mL (10 columns)	1
C103198	TurboVap® LV 100/120V	1
C103199	TurboVap® LV 220/240V	1
470-0050-B	ISOLUTE® NH2 500 mg/3 mL Sample Volume Columns	50

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