



Pesticides in Wastewater Using the Caliper Life Sciences TurboVap II Concentration Workstation

Introduction

Environmental testing labs performing liquid-liquid extractions on wastewater samples have traditionally used manual methods to concentrate sample extracts. When the TurboVap II is utilized, extraction throughput can double. Amro Environmental Lab Corporation (Merrimack, NH) has demonstrated this capability by applying the valuable labor that was previously used on manual concentration steps to extract more samples.

Method Summary

In this study, extraction of wastewater samples for pesticides followed SW-846 Method 3510. After a separatory funnel extraction, samples require evaporation to a final endpoint prior to analysis using SW-846 Method 8081 for Pesticides.

In past methodologies concentration was accomplished in two steps. First, Kuderna Danish flasks on an eight position water bath within a fume hood were used to begin the concentration. The Kuderna Danish glassware required washing, rinsing and drying that was very labor intensive. After concentration on the water bath, further concentration was needed on an Organomation N-Evap™ nitrogen evaporator to bring to an accurate final volume.

With two six position TurboVap II Workstations, sample extracts require only one concentration step in one piece of glassware. Sample extracts are collected in an erlenmeyer flask and passed through sodium sulfate into a 200mL TurboVap evaporation vessel. The vessels are placed in the TurboVap. Sample concentration is started after setting the water bath pressure and nitrogen flow rate. The methylene chloride extract is concentrated to 1mL in the TurboVap. Technicians are not required to monitor the concentration, as the electronic sensor stops the concentration at 1mL and an alarm sounds to alert the user the sample is completed. A solvent exchange is done by adding approximately 15mL of hexane to the TurboVap vessel and concentrating again to a final 1mL endpoint. The extract is then removed, brought to desired volume and transferred to a vial for analysis.

Equipment Specifications and Operating Conditions

CaliperLS TurboVap II

Solvent	Methylene Chloride
Solvent Starting Volume	200 mL
Solvent Exchange	Hexane
Solvent End Volume	10mL
Bath Temperature	41 °C
Gas Pressure	5-19 psi
Length of Concentration with Solvent Exchange Time	45 minutes

Analyte	Front Column			Rear Column		
	Spike Conc	Mean Result	Percent Recovery	Spike Conc	Mean Result	Percent Recover
Alpha-BHC	0.80	0.5438	68%	0.80	0.6875	86%
Gamma-BHC	0.80	0.6708	84%	0.80	0.6551	82%
Heptachlor	0.80	0.8850	111%	0.80	0.7291	91%
Aldrin	0.80	0.6323	79%	0.80	0.5715	71%
Beta-BHC	0.80	1.4851	185%	0.80	0.8984	112%
Delta-BHC	0.80	0.6984	87%	0.80	0.7881	99%
Heptachlor Epoxide	0.80	0.6188	77%	0.80	0.6943	87%
Endosulfan I	0.80	1.5266	191%	0.80	0.7810	98%
Gamma-chlordane	0.80	0.6369	80%	0.80	0.8891	111%
Alpha-chlordane	0.80	1.2356	154%	0.80	0.9544	119%
4,4'-DDE	1.60	1.1780	74%	1.60	3.2384	202%
Deildrin	1.60	1.2350	77%	1.60	3.0811	193%
Endrin	1.60	1.2341	77%	1.60	1.8708	117%
Endosulfan II	1.60	1.3094	82%	1.60	1.2885	81%
A4,4'-DDT	1.60	1.3785	86%	1.60	1.8966	119%
A4,4' DDT	1.60	1.5253	95%	1.60	1.4956	93%
Endrin Aldehyde	1.60	1.5164	95%	1.60	1.7953	112%
Endosulfan Sulfate	1.60	1.2854	80%	1.60	2.0866	130%
Methoxychlor	8.00	8.7373	109%	8.00	9.6814	121%
Endrin Ketone	1.60	1.5154	95%	1.60	1.9214	120%

Table 1. Results of Pesticide in Waste Water in pg/μL

Note: High recoveries are the result of co-elution as stated in SW-846 Method 8081, 3.9

Summary

Manual concentration procedures increased the risk of a technician's exposure to methylene chloride, required labor to prepare the glassware, and required a technician's time to monitor both the water bath concentration step and the nitrogen evaporation step. Twenty wastewater samples were extracted and concentrated in an eight hour day.

With the use of the TurboVaps, there is significantly less labor as glassware washing, rinsing and drying is minimal and exposure to solvents is decreased. Having one unattended concentration step not requiring monitoring allows technicians to better utilize their time and perform other tasks. Throughput was doubled to forty samples extracted and concentrated in an eight hour day.

Overall, the incorporation of the CaliperLS TurboVaps has increased productivity, lowered RSDs and minimized technician glassware, sample and solvent handling.

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