

Semi Automated Clean Up for Persistent Organic Pollutants in Fish - PCDD/Fs Analysis for Sample Extracts in Toluene

Introduction

The continued interest in Persistent Organic Pollutants (POPs), such as polychlorinated dibenzo-p-dioxins (PCDDs), furans (PCDFs), biphenyls (PCBs) and PBDEs, has led to a variety of automated systems for the cleanup of complex sample matrices. This has resulted in development of our fully automated "Power Prep" sample cleanup instead of manual preparative open column chromatography.

To meet demands for a lower cost method that requires little financial investment, we combined the features of the "PowerPrep" system - accurate, fast, reliable with short turnaround times and low background using FMS pre-packaged columns - with a relatively simple semi automated approach. An important feature of the semi-automated technique described here is that the samples can be in toluene (the method described here is for fish extracts in 2 mL toluene).

This semi-automated method is ideal for laboratories that want high quality sample processing without much financial investment.

Instrumentation

- FMS EZPrep123™ System
- Vacuum pump
- Thermo Trace 1310 GC with Thermo DFS Magnetic Sector high resolution MS

Consumables

- FMS, Inc. High Capacity Acidic Silica column
- FMS, Inc. Basic Alumina column
- FMS, Inc. Carbon-Celite column
- Fisher Pesticide Grade Hexane
- Fisher Pesticide Grade Dichloromethane

- Fisher Pesticide Grade Toluene
- CIL Method 1613 ¹³C PCDD/F Stock Solution
- CIL ¹³C PCDD/F Recovery Standard

Procedure

Stage 1:

- Assemble columns in order acidic silica - alumina - carbon.
- Syringe vial at top is used for conditioning and sample loading.
- Columns are conditioned with 40 mLs of hexane. Hexane is pulled by vacuum pump across all columns (vacuum, waste).
- Samples are loaded across system in 2-mL toluene (vacuum, waste).
- Columns are eluted with 60 mL hexane (vacuum, waste)
- Silica columns are removed and alumina - carbon columns are eluted with 50 mL dichloromethane (vacuum, waste)

Stage 2:

- Carbon columns are turned upside down and eluted in reverse with 60 mL toluene (Fraction 1, PCDD/Fs);
- Total run time is less than 45 min
- Number of parallel sample clean up channels is unlimited

Additional Features

- Low re-use of tubing, syringes, parts and glass ware
- No electronics and mechanical parts to fail
- No service contract or maintenance to worry about
- Fast, 45 minutes run time
- No repetitive motions and minimal cleaning of reusable parts



	Average	Stdev	RSD	EPA Window
2378-TCDF 13C12 STD	95.4	10.1	10.6	24-169
2378-TCDD 13C12 STD	118.7	12.7	10.7	24-169
12378-PeCDF 13C12 STD	101.5	10.4	10.3	24-185
23478-PeCDF 13C12 STD	99.5	9.3	9.4	21-178
12378-PeCDD 13C12 STD	103.8	10.3	9.9	25-181
123478-HxCDF 13C12 STD	93.3	9.8	10.5	26-152
123678-HxCDF 13C12 STD	90.5	9.8	10.9	26-123
234678-HxCDF 13C12 STD	92.4	10.1	10.9	28-136
123789-HxCDF 13C12 STD	102.7	10.8	10.5	29-147
123478-HxCDD 13C12 STD	99.7	9.9	9.9	32-141
123678-HxCDD 13C12 STD	92.8	9.0	9.7	28-130
1234678-HpCDF 13C12 STD	91.5	9.9	10.9	28-143
1234789-HpCDF 13C12 STD	110.6	11.2	10.2	26-138
1234678-HpCDD 13C12 STD	96.6	10.9	11.3	23-140
OCDD 13C12 STD	95.4	10.7	11.3	17-157

Table 1 with ¹³C-labeled recoveries in percent for PCDD/Fs in 10 g fish (n=12).

Conclusions

Excellent recoveries are seen with the new semi automated method using the FMS EZPrep123 System, as can be seen in Tables 1. Because the system is a closed system, mostly composed of disposable parts, the risk of cross-contamination is very low. Note that fish extracts in 2 mL toluene can be processed as such without any need for solvent exchange. The system can be set up as a low-cost alternative to the fully automated clean up equipment. Processing times are much shorter than other manual procedures. The certified prepackaged columns and simple, versatile system guarantee same morning or afternoon POPs analysis.

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