



ENVIRO



# DUAL CARTRIDGE SYSTEM FOR THE EXTRACTION OF ACIDS, BASES, AND NEUTRALS IN WATER



ENVIRO-CLEAN® METHOD 8270

## ENVIRO-CLEAN® METHOD 8270

UCT, Inc. offers a unique, 2 cartridge system and extraction procedure for EPA Method 8270. The procedure is reliable, efficient, and cost-effective. The tandem cartridge system uses UCT's proprietary 8270 cartridges in-line with our activated carbon cartridges. High throughput can be achieved by extracting multiple samples simultaneously using a multi-port SPE manifold combined with a 12 position collection rack, which allows for the simultaneous extraction of up to 12 samples at once. A set of 24 samples should be able to be extracted in 5 to 6 hours.

A wide range of 137 target analytes and 6 surrogates can be successfully analyzed using this method. The UCT 8270 cartridge retains the majority of the target analytes including acids, bases, and neutrals; meanwhile the carbon cartridge, connected downstream from the 8270 cartridge, captures several very polar compounds, such as n-nitrosodimethylamine, n-nitrosomethylethylamine, methyl methanesulfonate, ethyl methanesulfonate, and 1-Nitrosopyrrolidine.

### Product Benefits

- Cost-effective
- Reduced usage of organic solvents
- Simple and fast: only one sample pass is needed
  - 5-6 hrs for a batch of 24 samples.
- No emulsion or white precipitate generated
- Shorter solvent evaporation time
- Shorter sample turnaround time
- High sample throughput
- Excellent recovery and reproducibility
- Cleaner extracts and chromatograms
- Cartridge body manufactured from special, proprietary polypropylene – minimizing potential source of interferences
- Packaged in Mylar to maintain cleanliness



# EPA Method 8270 – Extraction of Acids, Bases, and Neutrals in Water Using Solid Phase Extraction

## 8270 Cartridge Kits

1 Liter Sample Size		
Part Number	Description	Units
<b>EC8270-KIT1L</b>	<b>ENVIRO-CLEAN® 8270 STARTER KIT</b>	Kit
Contents	30 x 8270 Extraction Cartridges (p/n EC82702M15), 30 x Carbon Extraction Cartridges (p/n EU52113M6), 30 x Cartridge Adaptors (p/n AD0000AS), 12 x Large Volume Transfer Tubes (p/n VMFSTFR12)	
<b>EC8270-1000REFL</b>	<b>ENVIRO-CLEAN® 8270 REFILL KIT</b>	Kit
Contents	30 x 8270 Extraction Cartridges (p/n EC82702M15), 30 x Carbon Extraction Cartridges (p/n EU52113M6)	
500 mL Sample Size		
Part Number	Description	Units
<b>EC8270-KIT</b>	<b>ENVIRO-CLEAN® 8270 STARTER KIT</b>	Kit
Contents	30 x 8270 Extraction Cartridges (p/n EC82701M15), 30 x Carbon Extraction Cartridges (p/n EU52112M6), 30 x Cartridge Adaptors (p/n AD0000AS), 12 x Large Volume Transfer Tubes (p/n VMFSTFR12)	
<b>EC8270-500REFL</b>	<b>ENVIRO-CLEAN® 8270 REFILL KIT</b>	Kit
Contents	30 x 8270 Extraction Cartridges (p/n EC82701M15), 30 x Carbon Extraction Cartridges (p/n EU52112M6)	
≤100 mL Sample Size		
Part Number	Description	Units
<b>EC8270-KIT100ML</b>	<b>ENVIRO-CLEAN® 8270 STARTER KIT</b>	Kit
Contents	30 x 8270 Extraction Cartridges (p/n EC8270506), 30 x Carbon Extraction Cartridges (p/n EU5211M6), 30 x Cartridge Adaptors (p/n AD0000AS), 12 x Large Volume Transfer Tubes (p/n VMFSTFR12)	
<b>EC8270-100REFL</b>	<b>ENVIRO-CLEAN® 8270 REFILL KIT</b>	Kit
Contents	30 x 8270 Extraction Cartridges (p/n EC8270506) 30 x Carbon Extraction Cartridges (p/n EU5211M6)	

- **UCT 8270 cartridge:** **EC82702M15** 2000 mg 8270 Sorbent in 15 mL Cartridge  
**EC82701M15** 1000 mg 8270 Sorbent in 15 mL Cartridge  
**EC8270506** 500 mg 8270 Sorbent in 6 mL Cartridge
- **Carbon cartridge:** **EU52113M6** 3000 mg Activated Carbon in 6 mL Cartridge  
**EU52112M6** 2000 mg Activated Carbon in 6 mL Cartridge  
**EU5211M6** 1000 mg Activated Carbon in 6 mL Cartridge

## Extraction Accessories

Part Number	Description	Units
<b>VMF016GL</b>	16 Position Complete Vacuum Manifold System	Complete Unit
Contents	1 x Glass Block 1 x 16 Position Corian Lid 1 x Cover Gasket 1 x Vacuum Gauge 1 x 16 Position Adjustable Collection Rack 1 x Glass Block Safety Tray 16 x PTFE Tips 16 x Bulkhead Luer Fittings 16 x Plugs	
<b>CLTTP050</b>	CLEAN-THRU® Tips	50
<b>ECROCKER400</b>	Vacuum Pump (1/8 H.P. / 115V / 4.2amps / 60Hz)	1
<b>ECUCTTRAP20</b>	20 L Waste Trap	1
<b>ECUCTTRAP20-ADPT</b>	3/8" X 1/4" PVFD Adapter for fitting Waste Trap to Glass Block Manifold	1
<b>VMF02125</b>	12 Position Large Volume Collection Rack	1

## PROCEDURE

### Reagents:

Methanol (MeOH) - HPLC grade	Acetone - Pesticide grade
n-Hexane – HPLC grade ( $\geq 95\%$ n-hexane)	Ammonium hydroxide (28-30%) - ACS grade
6N Hydrochloric acid (HCl)	Sodium thiosulfate - Reagent grade, anhydrous
Dichloromethane (DCM) - Pesticide grade, stabilized with amylene	
Sodium sulfate, ACS grade, anhydrous, granular 60 Mesh (UCT part#: <b>ECSS05K</b> )	

### SPE Procedure

#### Sample pretreatment

1. To 1 L of water sample add 80 mg of sodium thiosulfate if free chlorine present.
2. Adjust sample pH to less than 2 (use a pH meter) using 6N HCl.
3. Spike with surrogates.
4. For fortified samples, such as matrix spikes, spike target analytes, and mix well.

**Tip 1:** De-chlorinate sample prior to sample acidification.

**Tip 2:** Make sure sample pH is adjusted to  $\leq 2$  as measured with a calibrated pH meter; pH paper will not provide good enough specificity. Sample pH is critical to obtaining good recoveries for some acids and bases.

#### SPE system setup

1. Connect the carbon cartridge to the end of the 8270 cartridge using cartridge adaptor (**AD0000AS**).
2. Insert a loose plug of deactivated glass wool into the 8270 cartridge. This will minimize sorbent clogging caused by samples with a high particulate content.
3. Attach the connected SPE cartridges to the SPE manifold.

**Tip 3:** A carbon cartridge is NOT needed if very polar analytes are not being analyzed (e.g. n-nitrosodimethylamine, n-nitrosomethylethylamine, methyl methanesulfonate, ethyl methanesulfonate, and 1-Nitrosopyrrolidine)

#### Cartridge conditioning

1. Wash the cartridges with 15 mL of dichloromethane (DCM), allow them to soak for 1 min so that both cartridges are completely wetted.
2. Apply full vacuum for 1 min.
3. Add 10 mL of methanol. Allow the methanol to drip through both cartridges to the point where the solvent meniscus is just at the top of the 8270 cartridge sorbent bed. Do not let cartridges go dry from this step until instructed to do so at the cartridge drying step.
4. Add 10 mL of reagent water and draw through the cartridges until the water layer is just to the top of the 8270 cartridge sorbent bed.
5. Add 10 mL of 0.05N HCl and draw through until the solvent is about 1 cm above the 8270 cartridge sorbent bed

#### Sample extraction

1. Attach the large sample delivery tube (**VMFSTFR12**) to the 8270 cartridge, and insert the stainless steel end of the tube into the sample bottle.
2. Turn on the vacuum to the manifold and adjust it for a fast, dropwise sample flow (about 10-15 mL/min). Draw the entire sample through the cartridges.

## Washing and drying

1. Rinse the sample bottle with 5 mL of reagent water, and apply the rinsate to the cartridges.
2. Disassemble the tube and the connected SPE cartridges. Dry the 8270 cartridge under full vacuum for 10 min and the carbon cartridge for 15 min.

**Tip 4:** Remove as much water as possible, wet sorbent results in low analyte recovery.

**Tip 5:** For TCLP samples, rinse the 8270 cartridge with 10 mL of reagent water (bottle rinse); rinse the carbon cartridge with 3 mL of 28-30% ammonium hydroxide followed by 3 mL reagent water to remove the trapped acetic acid which otherwise will interfere the GC chromatogram and may degrade the GC column.

## Analyte elution

**NOTE: The 8270 and Activated Carbon Cartridges are eluted separately**

1. Insert glass collection vials (60 mL size) into the manifold to collect eluents.
2. Apply the elution solvents described below to the respective SPE cartridges; draw 1/3 through, allow the solvent to soak for 1 min., and draw the remaining through in a slow dropwise fashion.

### a. 8270 Cartridge Elution:

- i. 10 mL of 1:1 hexane:acetone (sample bottle and transfer tube rinse)
- ii. 20 mL of DCM (sample bottle and transfer tube rinse)
- iii. Remove the transfer tube from the 8270 cartridge
- iv. Remove the eluate container from the manifold
- v. Add 2-3 mL of 28-30% ammonium hydroxide to the 8270 cartridge, soak 2 min.; drain to waste; leave on full vacuum for 1 min.
- vi. Re-insert collection vials into the manifold
- vii. Elute with 3 x 7 mL of DCM

### b. Activated Carbon Cartridge Elution:

- i. Insert a fresh collection vial for the carbon cartridge eluent.
- ii. Elute with: 4 x 4 mL of DCM.

**Tip 6:** The bottle rinse is critical for good recovery of PAHs which can be adsorbed onto a glass surface.

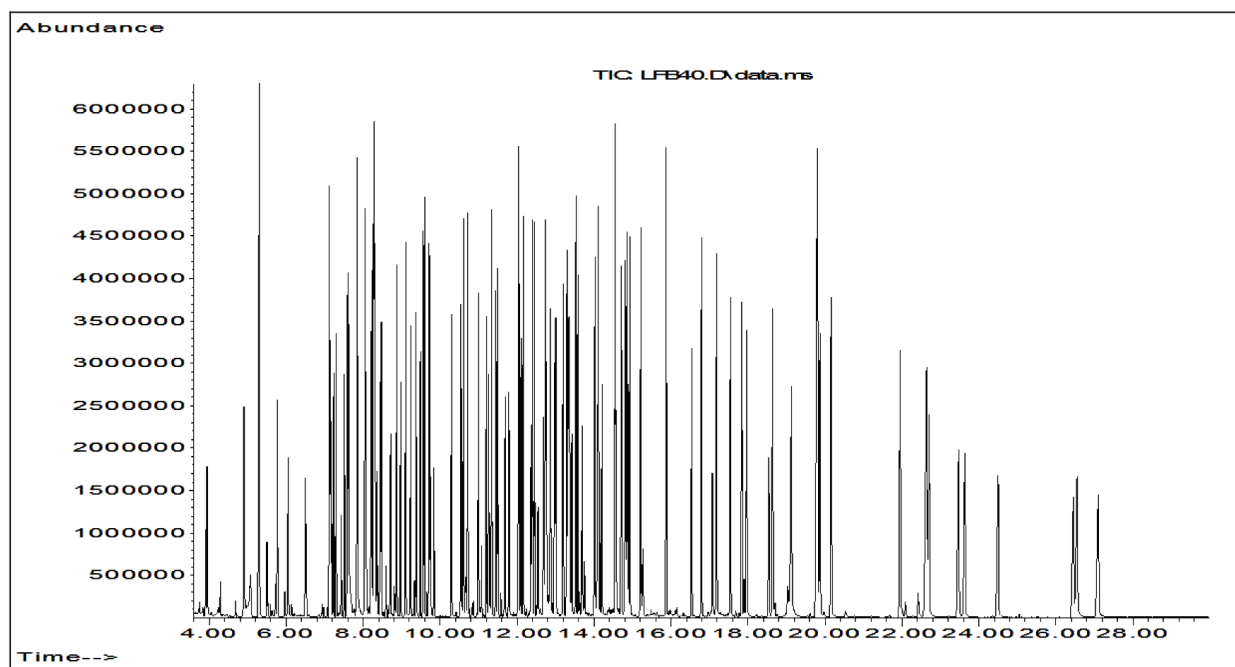
## Eluent Drying

1. Dry the eluate using a fritted 83 mL blank cartridge (or a glass funnel stopped with deactivated glass wool) holding about 20 g of anhydrous  $\text{Na}_2\text{SO}_4$ , pre-rinse the  $\text{Na}_2\text{SO}_4$  with 5 mL of DCM.
2. Insert a fresh 60-mL glass vial into the manifold to collect the dried 8270 eluent.
3. Pass the eluent from the 8270 cartridge through the  $\text{Na}_2\text{SO}_4$  bed.
4. Insert a fresh 60-mL glass vial into the manifold to collect the dried carbon cartridge eluent.
5. Pass the eluent from the activated carbon cartridge through the  $\text{Na}_2\text{SO}_4$  bed.
6. Rinse the vials with 10 mL of DCM and pass the rinsate through the  $\text{Na}_2\text{SO}_4$ ; collect in the dried carbon cartridge collection vial.

**Tip 7:** If the  $\text{Na}_2\text{SO}_4$  appears greenish, rinse with additional solvent until it turns white.

## Concentration

1. Concentrate the dried eluent to about 1 mL under a gentle stream of N<sub>2</sub> at 40° C. Combine the concentrated eluates from the 8270 and carbon cartridges and continue concentrating the combined extract to about 0.7-0.9 mL.
2. Transfer the concentrated extract to a 2 mL autosampler vial, adjust the final volume to 1 mL with DCM.
3. Add Internal Standards and mix well. The samples are ready for GC/MS analysis.



**Chromatogram of a Laboratory Fortified Blank at 40 µg/L**

## Table of Compounds Tested

Compound	Fortified reagent blank		MDL (µg/L) (n=7)
	Recovery%	RSD% (n=4)	
1,2,4,5-Tetrachlorobenzene	99.5	4.1	1.7
1,2,4-Trichlorobenzene	88.5	5.7	0.7
1,2-Dichlorobenzene	90.3	3.9	0.9
1,3,5-Trinitrobenzene	124.4	2.8	1.4
1,3-Dichlorobenzene	85.8	2.8	0.5
1,4-Dichlorobenzene	89.1	1.1	0.8
1,4-Naphthalenedione	95.3	4.3	1.7
1-Chloronaphthalene	112.2	2.7	2.1
1-Methyl fluorene	86.9	0.9	0.4
1-Methyl phenanthrene	89.8	1.3	0.5
1-Methylnaphthalene	102.1	2.7	2.2
1-Naphthalenamine	112.3	4.7	2.8
1-Nitrosopiperidine	88.9	5.8	0.7
1-Nitrosopyrrolidine	91.8	7.2	1.1
2,3,4,6-Tetrachlorophenol	103.2	0.9	0.8
2,3-Dichloroaniline	91.4	0.6	0.5
2,4,5-Trichlorophenol	123.5	4.7	2.4
2,4,6-Trichlorophenol	106.5	3.6	2.0
2,4-Dichlorophenol	97.3	6.5	0.5
2,4-Dimethylphenol	99.0	6.4	0.8
2,4-Dinitrophenol	122.4	2.0	2.4
2,4-Dinitrotoluene	112.0	1.7	1.1
2,6-Dichlorophenol	113.3	0.7	1.6
2,6-Dinitrotoluene	106.3	2.3	1.9
2-Acetylaminofluorene	109.0	6.5	1.3
2-Chloronaphthalene	96.9	2.8	2.3
2-Chlorophenol	99.4	2.9	0.6
2-Isopropyl naphthalene	73.1	0.1	0.4
2-Methylnaphthalene	101.2	4.9	2.2
2-Methylphenol	97.6	6.7	1.2
2-Naphthalenamine	130.5	2.7	1.2
2-Nitroaniline	107.5	3.6	2.4
2-Nitrophenol	98.2	5.9	1.1
2-Picoline	74.4	5.0	0.7
3&4-Methylphenol	104.2	6.6	3.0
3,3'-Dichlorobenzidine	72.3	11.4	1.2
3,6-Dimethyl phenanthrene	90.6	0.9	0.5
3-Methylcholanthrene	106.5	1.4	0.7
3-Nitroaniline	100.4	4.9	0.6
3-Nitrophenol	99.5	8.2	0.9
4,4'-DDD	94.4	0.8	0.3
4,4'-DDE	91.8	0.4	0.5
4,4'-DDT	94.0	0.3	0.6
4,6-Dinitro-2-methylphenol	116.8	4.5	1.6
4-Aminobiphenyl	103.8	13.5	1.6
4-Chloro-3-methylphenol	111.7	6.3	2.2
4-Chloroaniline	105.0	3.9	1.0
4-Chlorophenylphenylether	99.5	3.0	1.4
4-Nitroaniline	114.9	4.6	1.6
4-Nitrophenol	97.2	3.0	3.3
5-Nitro-o-toluidine	94.7	4.0	1.3
7,12-Dimethyl benz[a]anthracene	99.9	6.1	0.7
Acenaphthene	100.1	1.3	0.7
Acenaphthylene	102.6	0.6	1.9
Acetophenone	101.8	7.4	1.2
Aldrin	89.5	0.8	0.2
alpha lindane	90.1	0.2	0.4
Aniline	90.0	3.2	2.1
Anthracene	109.7	1.1	1.4
Azobenzene	105.5	5.2	1.5
Benz[a]anthracene	103.3	6.2	1.4
Benzidine	66.8	14.0	0.9
Benzo[a]pyrene	99.3	2.1	0.8
Benzo[b]fluoranthene	99.4	7.0	0.7
Benzo[g,h,i]perylene	104.2	1.1	0.9
Benzo[k]fluoranthene	108.1	5.4	0.6
Benzoic acid	115.0	4.7	1.1
Benzyl alcohol	72.9	12.9	1.8
Benzyl butyl phthalate	111.8	6.0	1.1
beta lindane	95.2	1.1	0.4
Bis(2-ethylhexyl) phthalate	113.2	2.0	1.1
Bis(2-chloroethoxy)methane	91.0	7.8	0.8
Bis[2-chloroethyl]ether	88.5	3.0	0.7

Compound	Fortified reagent blank		MDL (µg/L) (n=7)
	Recovery%	RSD% (n=4)	
Bis[2-chloroisopropyl]ether	87.3	4.5	0.5
Bromophenoxybenzene	99.6	4.8	1.1
Carbazole	109.6	3.3	1.2
Chlorobenzilate	116.3	9.4	0.8
Chrysene	103.3	1.2	0.6
delta lindane	95.2	0.8	0.5
Diallate (cis & trans)	104.7	4.5	1.7
Dibenz[a,h]anthracene	108.8	2.5	0.8
Dibenzofuran	102.0	0.6	0.8
Dibutyl phthalate	114.6	6.2	1.3
Dieldrin	94.5	0.7	0.5
Diethyl phthalate	110.4	1.2	1.4
Dimethoate	96.6	0.7	0.7
Dimethyl phthalate	110.3	1.3	2.1
Di-n-octyl phthalate	116.6	5.9	0.5
Dinoseb	121.9	1.7	1.2
Diphenylamine	109.9	4.8	1.5
Disulfoton	87.0	0.6	0.8
Endosulfan I	93.8	0.7	0.4
Endosulfan II	96.5	0.5	0.4
Endosulfan sulfate	96.2	0.7	0.6
Endrin	97.4	1.0	0.4
Endrin aldehyde	93.4	0.5	0.8
Ethyl methanesulfonate	92.5	3.7	1.0
Famphur	109.3	1.2	3.4
Fluoranthene	105.8	6.1	1.2
Fluorene	103.7	2.6	1.4
gamma lindane	93.1	1.3	0.4
Heptachlor	88.1	1.0	0.4
Heptachlor epoxide	93.4	0.9	0.4
Hexachlorobenzene	101.3	6.1	1.1
Hexachlorobutadiene	85.0	1.0	1.0
Hexachloroethane	92.6	6.0	1.1
Hexachloropropene	72.1	1.1	0.8
Hexachlorocyclopentadiene	85.9	3.1	1.1
Indeno[1,2,3-c,d]pyrene	103.2	2.5	0.9
Isodrin	105.1	7.2	1.0
Isophorone	91.0	6.8	1.0
Isosafrole (cis & trans)	102.9	6.1	2.1
Methyl methanesulfonate	70.8	3.5	0.5
Methyl parathion	96.6	0.4	0.9
Naphthalene	97.2	2.3	0.7
Nitrobenzene	94.0	7.2	1.2
N-nitro-di-n-propylamine	99.3	6.3	0.9
N-nitroso di-n-butylamine	99.9	4.7	2.3
N-nitrosodiethylamine	89.4	3.7	0.7
N-nitrosodimethylamine	68.8	3.0	0.7
N-nitrosomethylethylamine	87.4	2.5	0.9
o,o,o-Triethylphosphorothioate	90.8	0.4	0.4
o-Toluidine	91.4	9.7	1.3
Parathion	95.8	0.7	0.7
p-Dimethylaminoazobenzene	91.5	10.5	0.6
Pentachlorobenzene	90.9	1.0	0.4
Pentachloroethane	86.0	3.8	0.7
Pentachloronitrobenzene	104.3	4.2	1.4
Pentachlorophenol	109.3	3.3	2.6
Phenacetin	116.4	3.9	1.4
Phenanthrene	108.0	0.4	1.0
Phenol	56.2	4.2	1.1
Phorate	86.7	0.1	0.6
Pronamide	111.2	5.2	2.3
Pyrene	109.1	8.5	1.1
Pyridine	46.1	8.0	0.6
Safrole	90.7	4.3	1.3
Sulfotep	92.5	0.8	0.3
Thionazin	95.1	0.7	0.8
Surrogates			
2-Fluorophenol (S)	87.2	0.6	MDL not determined for surrogate
Phenol d6 (S)	59.1	0.4	
Nitrobenzene d5 (S)	94.3	1.0	
2-Fluorobiphenyl (S)	81.5	0.5	
2,4,6-Tribromophenol (S)	95.4	0.2	
p-Terphenyl d14 (S)	97.5	1.0	