



A Study of DryDisk® Background Contamination

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Introduction

The DryDisk® Separation Membrane was designed to replace conventional sodium sulfate in the drying of sample extracts. The DryDisk® is a hydrophobic membrane, consisting of a GORE-TEX® process filtration media based on polytetrafluoroethylene (PTFE). The hydrophobic property of the membrane allows the extracting solvent to pass through it, while retaining any water in the sample extract on the membrane's surface.

During the development of the DryDisk®, important design criteria were noted. First, the DryDisk® must be easy to handle. Second, the sealing surface of the disk must be simple, yet reliable. And third, the assembly could not be a source of background contamination.

The first two criteria were solved by adding a supporting ring made of a high grade polypropylene that was then attached using a special adhesive.

Extensive testing for contamination was conducted during the design stage of the DryDisk®. It is the goal of this application note to discuss the results of those tests.

Instrumentation

- Horizon Technology SDS-100 Solvent Drying System
- Horizon Technology DryDisk®
- Methylene Chloride (Pesticide Residue Grade)

Method Summary

Test A: Complete Assembly Test

- 1) Prepare two 1000 mL reagent water aliquots.
- 2) Adjust the samples' pH to be less than 2.
- 3) Spike the complete 8270 mix into the samples.
- 4) Extract the samples with conventional LLE.
- 5) Dry one sample with sodium sulfate.
- 6) Dry the other sample with DryDisk®.
- 7) Analyze both samples with GC/MS and compare results.

Test B: Polypropylene Ring Test

- 1) Sections of the Polypropylene ring were sonicated for:
 - a. 15 minutes
 - b. 30 minutes
 - c. 15 minutes with a 30 second DCM prewash
 - d. 30 minutes with a 30 second DCM prewash
- 2) Each of the above extracts was analyzed by the EPA method 8270.

Test C: Adhesive Test

- 1) Specific amounts of the adhesive were sonicated for:
 - a. 15 minutes
 - b. 30 minutes
 - c. 15 minutes with a 30 second DCM prewash
 - d. 30 minutes with a 30 second DCM prewash
- 2) Each of the above extracts was analyzed by EPA method 8270.

Results

The samples were spiked with a full 8270 mix but, as most contamination typically appears in the form of phthalates, the data in Table 1 was condensed to focus on these compounds. As seen from the data, the recoveries for the various phthalate compounds closely match those from the sodium sulfate run. This indicates that the DryDisk® membrane and holder assembly introduced no additional phthalates.

Table 1: Test A Results - Complete Assembly Test

Analytes	DryDisk		NaSO4-2	
	Conc. (µg/ml)	Rec. (%)	Conc. (µg/ml)	Rec. (%)
Phenol	6.05	37.8	6.10	38.1
Naphthalene	12.03	75.2	12.74	79.6
2,6-Dichlorophenol	12.23	76.4	12.97	81.1
Dimethyl phthalate	12.80	80.0	17.20	107.5
2,4-Dinitrophenol	8.43	52.7	6.39	39.9
Pentachlorobenzene	12.64	79.0	13.22	82.6
4-Nitrophenol	14.31	89.4	13.92	87.0
2,3,4,6-Tetrachlorophenol	13.86	86.6	13.81	86.3
Diethyl phthalate	13.50	84.4	13.31	83.2
Pentachlorophenol	13.80	86.3	12.57	78.6
Methyl parathion	16.20	101.3	15.61	97.6
Heptachlor	13.92	87.0	14.39	89.9
Di-n-butyl phthalate	15.26	95.4	16.35	102.2
Aldrin	14.30	89.4	14.65	91.6
Bis(2-ethylhexyl) adipate	14.93	93.3	15.66	97.9
Butyl benzyl phthalate	15.13	94.6	15.81	98.8
Chrysene	14.86	92.9	14.94	93.4
3,3'-Dichlorobenzidine	13.70	85.6	13.84	86.5
Bis(2-ethylhexyl) phthalate	16.55	103.4	15.34	95.9
Di-n-octyl phthalate(CCC)	14.87	92.9	15.06	94.1

Test B focused on possible contamination coming from the polypropylene ring. As polymers and plastics are typically good sources of phthalates, the ring material was extracted for both 15 and 30 minutes using a sonication system. Pieces of the ring were placed into vials and sonicated with DCM, for the specified times. The extract was then run using a GC/MS properly configured and tuned for the 8270 analytes. The results indicated no detectable background. Test C focused on the adhesive used to bond the

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polypropylene ring to the membrane surface. This adhesive is a proprietary product from W.L. Gore. The tests for the adhesive were exactly the same as conducted in Test B. The results also indicated no background contamination.

During a demonstration of the DryDisk® system to the Colorado Department of Health, a few of the EPA Method 525.2 analytes were run. The purpose of this test was to look at the recovery values and possible contamination introduced by the system. Once again, evidence of contamination would be indicated by an elevated phthalate recovery. The results of this test are shown in Table 2. They indicate, once again, that the DryDisk® system does not introduce contamination to an extract.

Conclusions

In this test, the complete DryDisk® system, including the holder, was tested for background contamination using EPA Method 8270 and Method 8270 procedures. The results of these tests on the DryDisk® and SDS-100 solvent drying system indicate that they do not increase the background contamination.

Acknowledgements

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Table 2: EPA Method 525.2 Recovery Results

Compounds	Conc.	% Rec.
INT STD	5.00 ug/L	
Acenaphthene – d10	5.00	100.0%
Phenanthrene – d10	5.00	100.0%
Chrysene – d12	5.00	100.0%
SURROGATES	5.00 ug/L	
1,3-Dimethyl-2-Nitrobenz	5.03	100.6%
Pyrene – d10	4.4.0	88.0%
Perylene – d12	4.70	94.0%
TARGETS		
Hexachlorocyclopentadiene	0.45	90.0%
Dimethylphthalate	0.51	102.0%
2,6-dinitrotoluene	0.31	62.0%
Acenaphthylene	0.41	82.0%
Fluorene	0.52	104.0%
Diethylphthalate	0.58	116.0%
Hexachlorobenzene	0.54	108.0%
Pentachlorophenol	0.24	48.0%
di-n-Butylphthalate	0.52	104.0%
Pyrene	0.48	96.0%
Butylbenzylphthalate	0.52	104.0%
Di (2-ethylhexyl) adipate	0.50	100.0%
Chrysene	0.53	106.0%
Di (2-ethylhexyl) phthalate	0.56	112.0%

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