Sample Clean-up by Gel Permeation Chromatography Using Agilent EcoSpheres

Application Note

Food Testing and Agriculture

Author

Greg Saunders and
Ben MacCreath
Agilent Technologies, Inc.
2850 Centerville Road
Wilmington, DE 19809-1610
USA

Introduction

Governments around the world require the analysis of environmental and food samples for a wide range of contaminants that potentially threaten human health or pose environmental risk. As a consequence, public and private bodies may be required to determine trace levels of these pollutants from many biological sources. Common contaminants include pesticides, herbicides and fungicides used in commercial farming, and priority pollutants.

The analysis of pesticides and priority pollutants from complex environmental samples by GC, GC/MS, HPLC or LC/MS is more successful if low volatility, high molecular weight interferences, such as lipids, pigments, proteins, humic acids and plasticizers, are removed first. Failure to remove these interfering compounds can shorten column lifetime and increase analytical downtime.

Using gel permeation chromatography (GPC), it is easy to isolate contaminants from high molecular weight interferences, so that they can be collected for further analysis. Highly reproducible Agilent EcoSpheres clean samples from complex biological matrices, such as plant and animal tissue, by GPC. EcoSpheres is an economic, loose microporous material in a dry-powder form ready for swelling and gravity packing into glass columns. Microporous materials have low levels of crosslinking and no permanent pore structure. Instead, pores are generated when these materials swell in solvents. Microporous packings allow higher loadings, where high resolution is not required.

An example of the GPC clean-up technique with EcoSpheres is provided here using an EPA test mix.

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Method and Results

The EPA has defined a sample clean-up method [1] for the removal of lipids and other high molecular weight interferences from a sample containing pesticides or other species of interest. As part of that method, a separation of a test solution is suggested to determine the performance of the method (Figure 1). The GPC calibration solution is prepared in dichloromethane containing corn oil, bis(2-ethylhexyl) phthalate, methoxychlor, perylene, and sulfur.

1. Corn oil (25,000 mg/L)
2. Bis(2-ethylhexyl) phthalate (1,000 mg/L)
3. Methoxychlor (200 mg/L)
4. Perylene (20 mg/L)
5. Sulfur (80 mg/L)

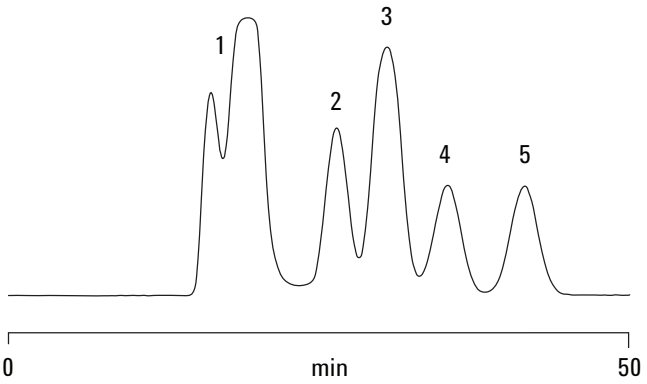

Figure 1. Separation of a five-component test mix by gel permeation chromatography using EcoSpheres, with resolution of all components, illustrating EcoSpheres suitability for applications covered by EPA 3640A.

Conditions

Column	EcoSpheres glass column, 450 x 25 mm (EcoSpheres loose media (100 g) p/n PL1460-4M03; complete glass column p/n PL1310-0054)
Sample	EPA test mix
System	Agilent 1260 Infinity Isocratic Pump and Manual Injector
Eluent	Dichloromethane
Flow Rate	5 mL/min
Detector	Agilent 1260 Infinity Variable Wavelength Detector VL, 254 nm
Data collection/ analysis	Cirrus GPC software and PL DataSteam data capture unit

Conclusions

The criterion for a test separation of contaminants in an environmental or food sample under EPA 3460A is that each of the contaminant peaks can be resolved. Although the peaks were broad in this example, due to the use of a large particle size, microporous packing material, all of the components were resolved successfully. Gel permeation chromatography with EcoSpheres is thus an ideal clean-up technique to facilitate the removal of interferences that cause poor analytical results when assessing environmental and food contaminants. Using this combination ensures a simple interpretation of the final analytical step, reducing total analysis time and cost.

Reference

1. EPA Method 3640A Gel-permeation cleanup

For More Information

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