



Chlorinated Pesticides

This application demonstrates the effectiveness of capillary GC for the rapid analysis of 16 chlorinated pesticide standards.

Introduction

Pesticides are used widely throughout the world to control pests (insects, fungi and weeds) and to ensure the supply of agricultural products, which are of great importance in sustaining life on this planet. The application of pesticides to agricultural land, however, results in runoff of pesticide residues into the groundwater and drinking water supply where it poses significant health and toxicity risks to aquatic biota, wildlife and humans. Capillary gas chromatography (GC) has been demonstrated to be an effective analytical technique for the determination of trace levels of pesticides in water. The United States EPA Method 608 for their Contract Lab Programme (CLP) mandates the use of capillary GC for the quantification of chlorinated pesticides and PCBs in groundwater, soils and sediments. The application shown here, while using a column of different dimensions than called for in EPA Method 608, is illustrative of the utility of capillary GC for the rapid analysis of 16 chlorinated pesticide standards.

Instrumentation/Equipment

An HP6890 GC (Agilent Technologies, USA) equipped with split/splitless injector, and flame ionization detection was used with a Zebtron ZB-1701 (14%-cyanopropylphenyl-86%-dimethyl polysiloxane), 15 m × 0.25 mm × 0.25 µm capillary GC column from Phenomenex (USA).

Experimental Conditions

Hydrogen was used as the carrier gas. Carrier gas flow-rate was set to 50 cm/s (1.47 mL/min @ 100 °C). Injection volume was 1 µL of sample with a split ratio of 100:1 and the injection port was held at 250 °C. Flame ionization detection (FID) was at 285 °C. The separation was performed under programmed temperature conditions as follows:

Initial temperature:	100 °C
Initial time:	50 min
Temperature rise:	20 °C/min
Final temperature 1:	200 °C
Final time 1:	0 min
Temperature rise 2:	5 °C/min
Final temperature:	250 °C
Final time 2:	0 min

Results

The 16 chlorinated pesticides were separated with baseline

resolution in less than 15 minutes. Improved limits of detection and sensitivity can be obtained by the use of an electron capture detector (ECD) and confirmation of peak identity can be obtained using mass spectrometry (MS). Improved sample loading and method detection limits can also be obtained by using a larger internal diameter column (0.53 mm) and a thicker stationary phase (1.0 µm).

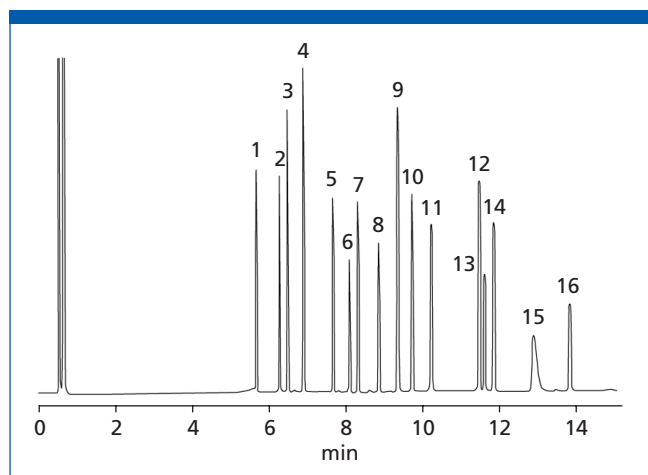


Figure 1: A standard mixture of 16 chlorinated pesticides were separated on a ZB-1701, 15 m × 0.25 mm × 0.25 µm column. Peaks: 1 = α-BHC, 2 = γ-BHC, 3 = heptachlor, 4 = aldrin, 5 = β-BHC, 6 = δ-BHC, 7 = heptachlor epoxide, 8 = endosulfan I, 9 = 4,4'-DDE, 10 = dieldrin, 11 = endrin, 12 = 4,4'-DDD, 13 = endosulfan II, 14 = 4,4'-DDT, 15 = endrin aldehyde, 16 = endosulfan sulfate.

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