Fast Analysis of Brominated Diphenyl Ethers Using GC/MS

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Introduction
Polybrominated diphenyl ethers (PBDEs) are a commercially available class of flame-retardants that have been shown in laboratory tests to have environmental and health affects similar to polychlorinated biphenyls (PCBs) and dioxins. The resistance to environmental degradation and the tendency for long-range transport and bioaccumulation make them a potential threat to humans. Use of the more dangerous penta and octa mixtures are currently banned in the European Union (EU), with bans on the deca mixtures expected by 2006. Although the Environmental Protection Agency (EPA) has not formally implemented regulations, concern over the rising levels of PBDEs found in humans has caused states such as California to propose legislation that would ban their production. Herein, we present a cost effective and reliable GC/MS analysis of PBDEs using the high-temperature, low-bled, Zebron ZB-5 column from Phenomenex, Inc.

Experimental Conditions
Analyses were performed using a HP 6890 (Agilent Technologies, Palo Alto, CA, USA) equipped with a 5973 MSD detector and autosampler. HP ChemStation software was used for the data analysis. The GC column used was a Zebron ZB-5 30 m x 0.25 mm x 0.25 µm (Phenomenex Torrance, CA, USA). Injection was splitless pulsed 30 psi @ 275 °C 1 µL. Helium flow rate was programmed at 1 mL/min for 45.74 min to 2.0 mL/min at 70 mL/min. Oven program was 110 °C for 1 min to 180 °C @ 12 °C/min for 1 min to 240 °C @ 4 °C/min for 20 eig min to 280 °C @ 4 °C/min for 5 min, to 280 °C @ 4 °C/min for 10 min. Standards were purchased from Wellington Laboratories Inc. (Guelph, Ontario, Canada).

Results
The use of low resolution GC/MS allows this method to be implemented by almost any lab without the need to purchase expensive new equipment. The Zebron column provided resolution of 23 individual PBDE congeners, including the five most commonly encountered in human samples, BDEs 47, 99, 100, 153, and 154. This low-cost, simple method allows for fast implementation and accurate results.

Discussion
Increased awareness of PDDE toxicity will undoubtedly convince the US to follow EU's lead and ban the use of PBDE compounds. The accurate identification of all congeners from other related compounds, such as polychlorinated biphenyls (PCBs) and PCBs, will require an analytical method with MS detection system.

The proposed method allows the typical environmental lab to use their current instrumentation in conjunction with the Zeborn ZB-5 GC column with features such as high upper temperature limits, low bleed, and long lifetimes in obtaining fast, accurate, and repeatable data.

References:

ORDERING INFORMATION

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<th>Part No.</th>
<th>Description</th>
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<td>7HG-G002-11-TN</td>
<td>ZB-5, 30 m x 0.25 mm x 0.25 µm</td>
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