APPLICATION NOTE

GC Applications Using Highly Polar Phases

INTRODUCTION

- The analysis of volatile mixtures using gas chromatography is demanding and the use of complimentary phases can offer benefits to complete separation. Highly polar phases are noteworthy as their retention mechanism is orthogonal to other phases and so can yield quite different separations.
- Described here are the alternative use of a range of phases: a carborane phase (HT8), a non-polar phase (BPX5), and a highly polar phase (BPX90); for some common analyses that often suffer from coelution problems.
- BPX90 is a highly polar phase that offers useful separations in its own right, but it is also an ideal compliment to BPX5 or HT8 for 2D-GC applications.

RESULTS

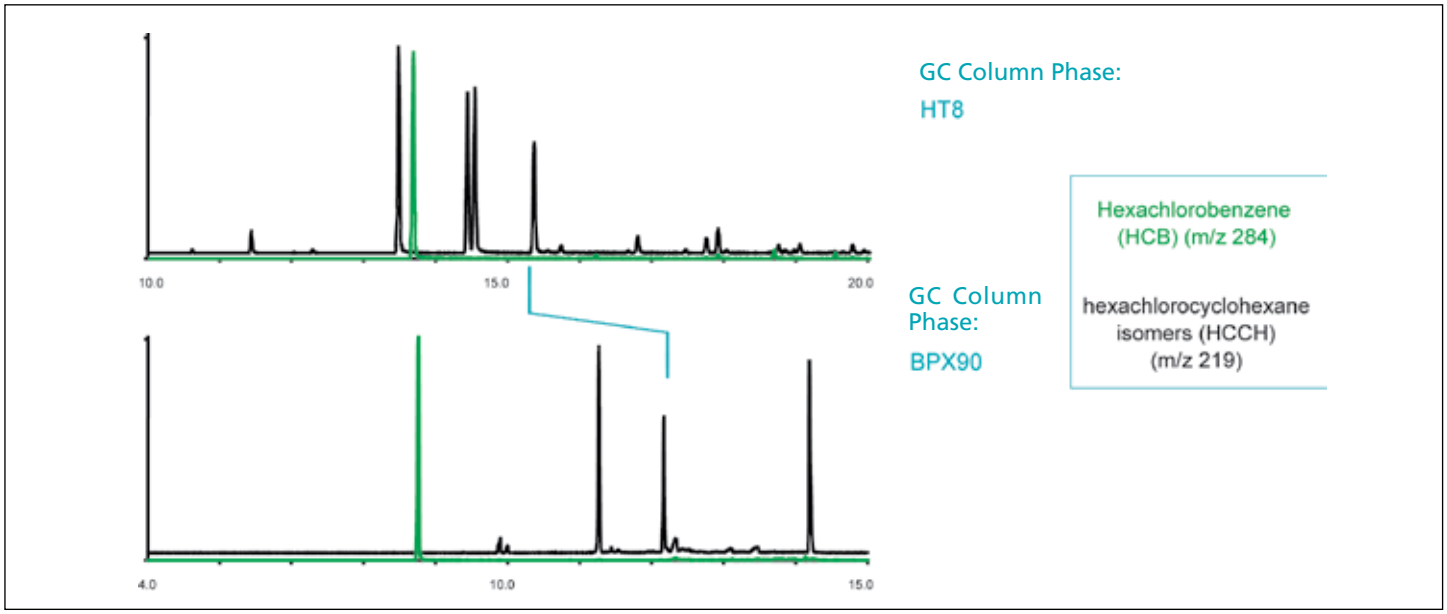

Figure 1. HCCH isomers and HCB.

- Baseline resolution of Lindane (γ-hexachlorocyclohexane) from its β-isomer is readily achieved using a carborane based HT8 column.
- Separation is primarily by boiling point but is enhanced by interaction with the carborane phase.
- BPX90 provides complimentary separation mechanisms based on π–bonding for hexachlorobenzene and on surface polarity for hexa chlorocyclohexanes. Changed elution order for HCCH isomers (and loss of resolution for all isomers) suggests BPX90 is a suitable alternative for chromatography of diasteriomers and other structural isomers.

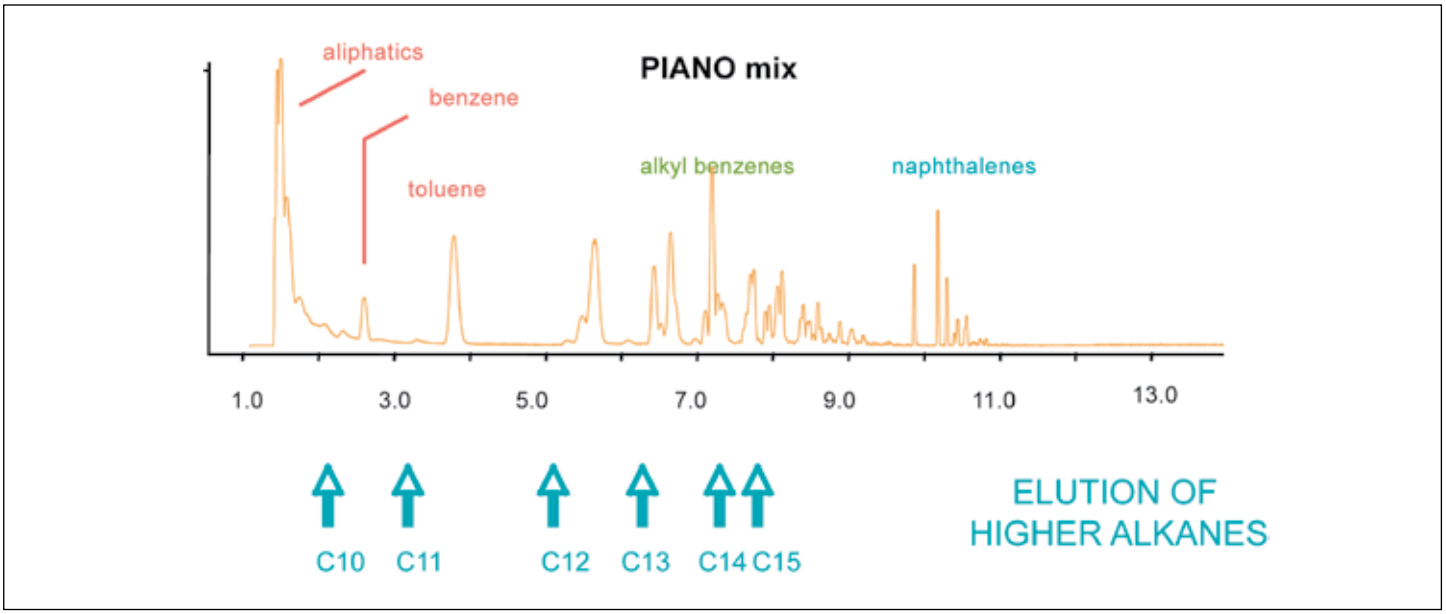

Figure 2. Separation of aromatics on BPX90.

- BPX90 allows effective speciation of aliphatics, simple aromatics and polycyclics.
- Separation is based on both boiling point and π-π interactions for aromatics meaning the phase will also speciate aromatics on the basis of electron density and so allows the separation of ortho, meta and para substituted forms.

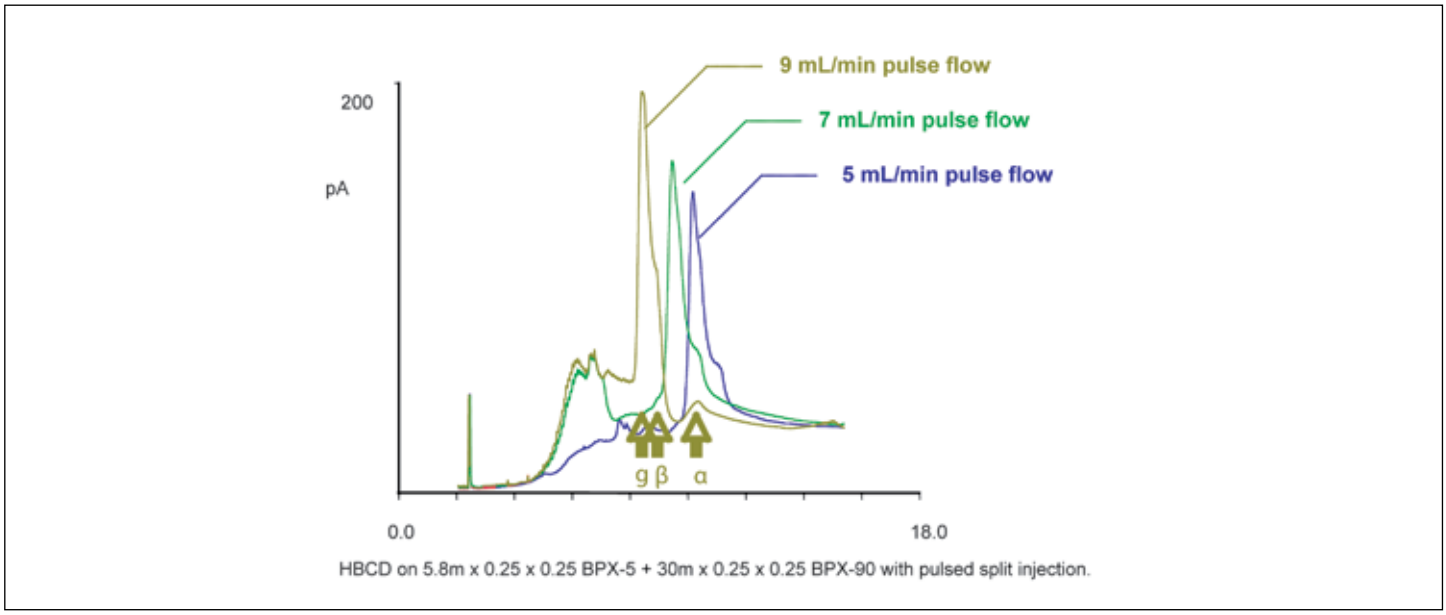

Figure 3. Separation of hexabromocyclododecanes..

- Separation of the HBCDs is made difficult by their interconversion at temperatures above 160 ˚C and by debromination.
- The unique characteristics of BPX90 allow separation based on differences in the phase interaction with the n-electrons on axial and equatorial bromine atoms.
- Separation may be improved with thicker film columns and reduced temperature.

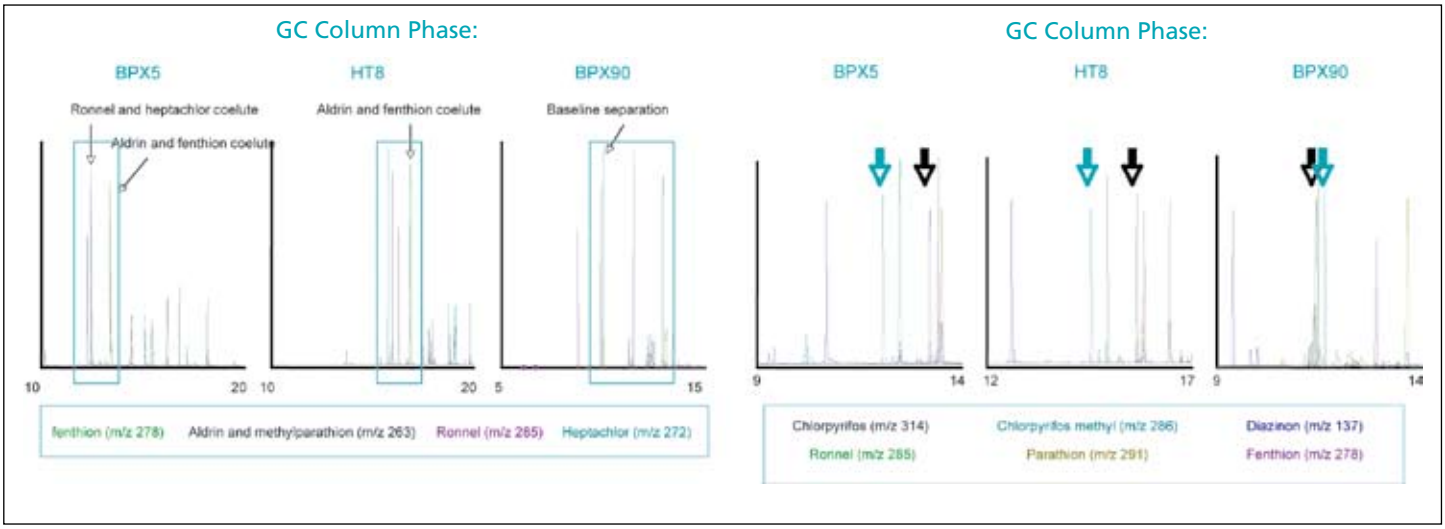

Figure 4. Variable GC column phase selectivity for pesticides & thiophosphate esters.

- Polar phase separation of thiophosphate esters shows a reversal of elution order for chlorpyrifos ethyl and methyl showing BPX90 separation is dominated by π-π mediated rather than boiling point based separations.
- Steric hindrance of π-bonds and steric volume can contribute to separation using BPX90.
- The unique characteristics of BPX90 allow separation based on differences aromatic electron density caused by different functional groups.

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