Evaluation of HPLC Stationary Phases for Environmental Analysis

Ken Butchart, Sandra Hanson. • Fortis Technologies Ltd, 45 Coalbrookdale Road, Cheshire, CH64 3UG, UK

Introduction

In environmental monitoring there are many compounds which have similar structure and this can make the analysis of pollutants difficult to achieve in a simple cost effective way.
Chromatography provides the option to gain resolution and sensitivity of many environmental compounds in a short time, the use of UV detection or more commonly Mass Spectrometer detection provides accurate and rapid confirmation.

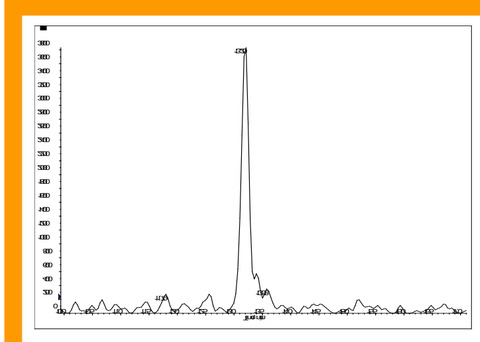
Pesticides, Polyaromatic Hydrocarbons (PAHs), PhenoxyHerbicides, Aldehydes and Explosives all present a challenge in the diversity of structures, required mobile phases and stationary phase choice. This means that a wide range of chromatographic techniques must be utilised in order to gain the resolution required.

Here we present data on a variety of applications and highlight where improvements in current methodology have been made.

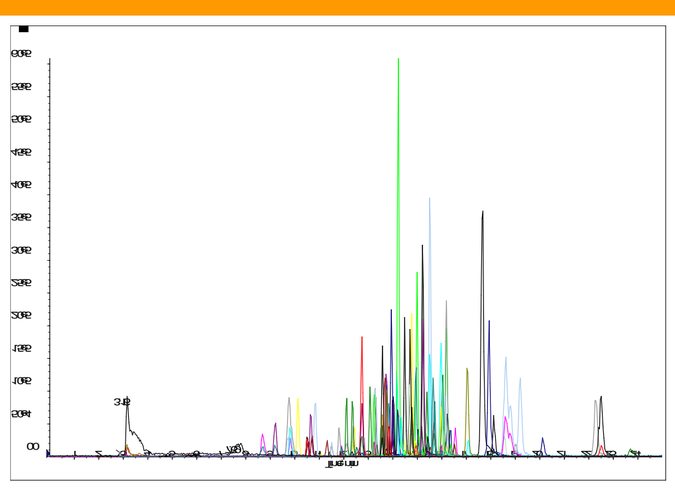
Improving Transition Identification

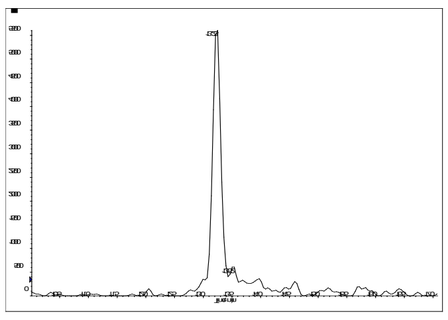
By selecting the correct stationary phase for the analysis of both polar and non-polar compounds, resolution can be improved due to the sharp peak shapes and improved retention.

FIGURE 1. Analysis of 135 Pesticide Transitions – Apple Matrix



Thaibendazole 0.9% Column carryover
Fortis™ C18, 150x2.1mm, 3um





Thaibendazole 1.9% Column carryover
Atlantis® d C18, 150x2.1mm, 3um

Mobile phase A = aq 10 mM ammonium acetate

Mobile phase B = methanol

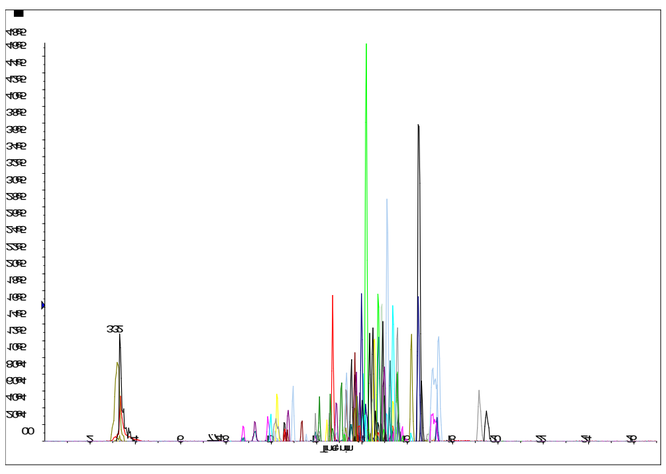
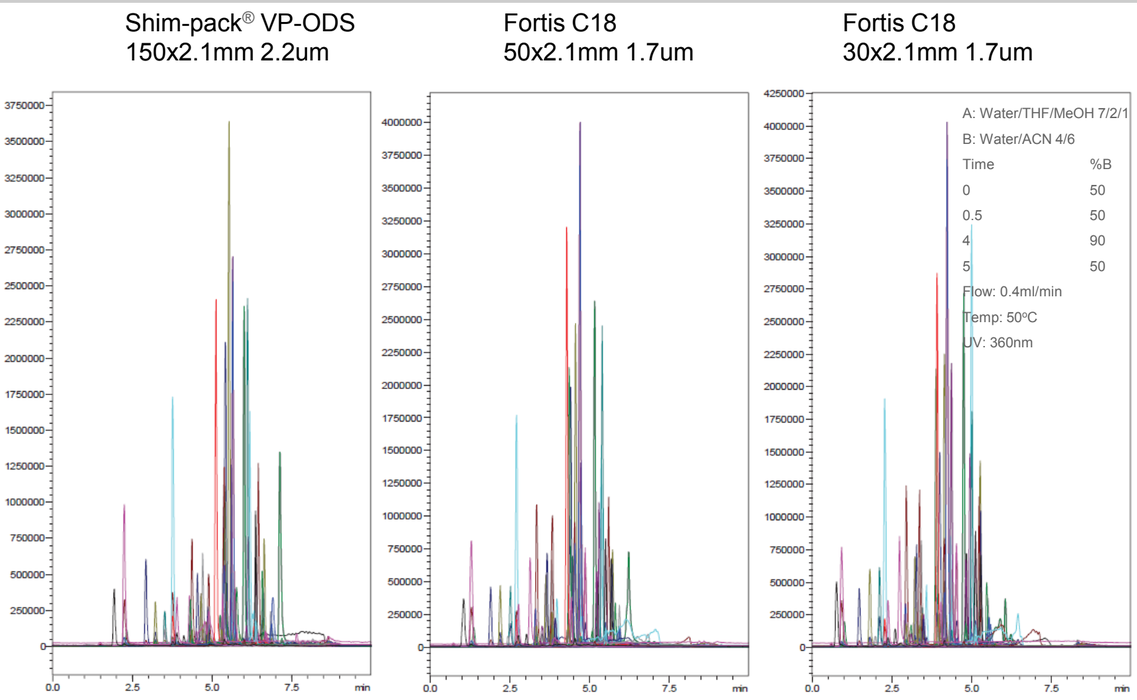


Figure 1. Shows how the analysis of 105 pesticide compounds in 135 transitions is achievable, the Fortis column providing greater no. of identifications whilst also having less sample column carryover.

FIGURE 2. KFDA 83 59



Failure to meet maximum exposure limits imposed by many Food agencies can prove a barrier to trade, therefore accurate measurement of pesticide levels in agricultural products is important. Figure 2 shows that selection of a sub 2um particle size can increase number of resolved peaks even when using a shorter column length – thereby generating less column backpressure and wear on the system.

Application of UHPLC to Reduce Analysis Times

As well as improving compound identification selection of the correct UHPLC column technology allows the analyst to reduce run times whilst improving peak resolution. Figure 3 shows the analysis time of 14 aldehydes successfully reduced from 20 to 4 minutes.

FIGURE 3. Increased speed of Aldehyde Analysis

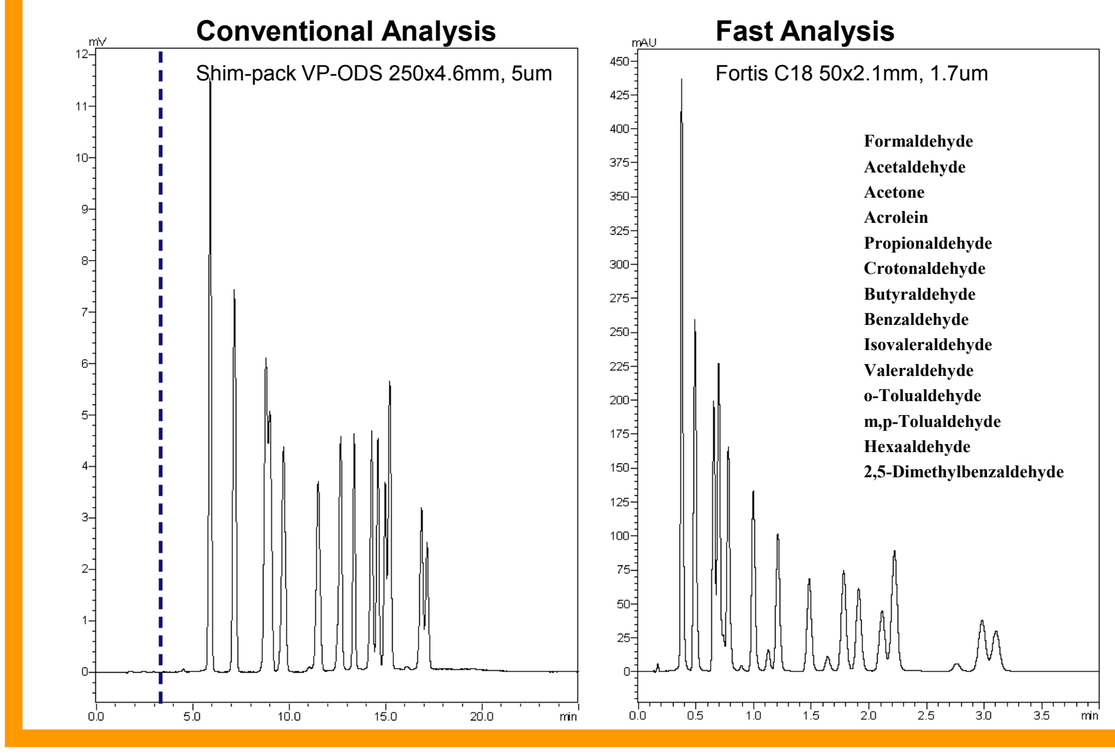


FIGURE 4. PAH Analysis

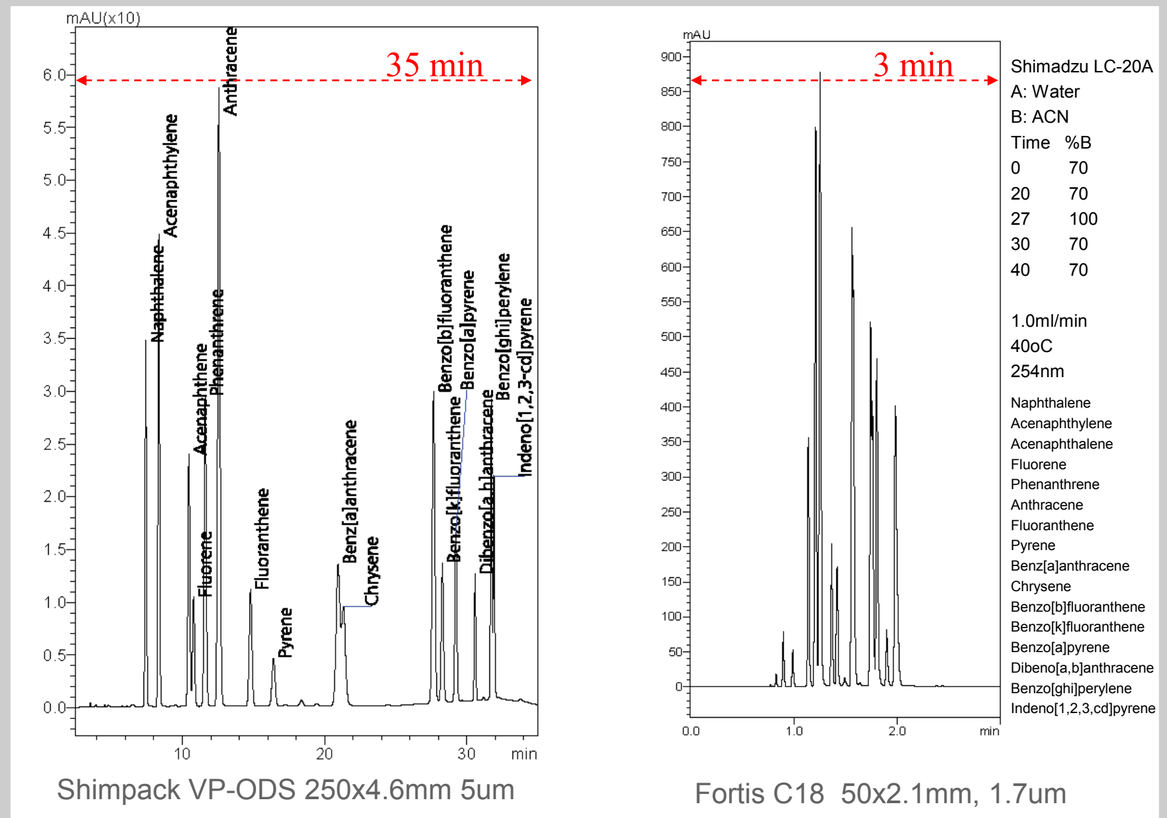
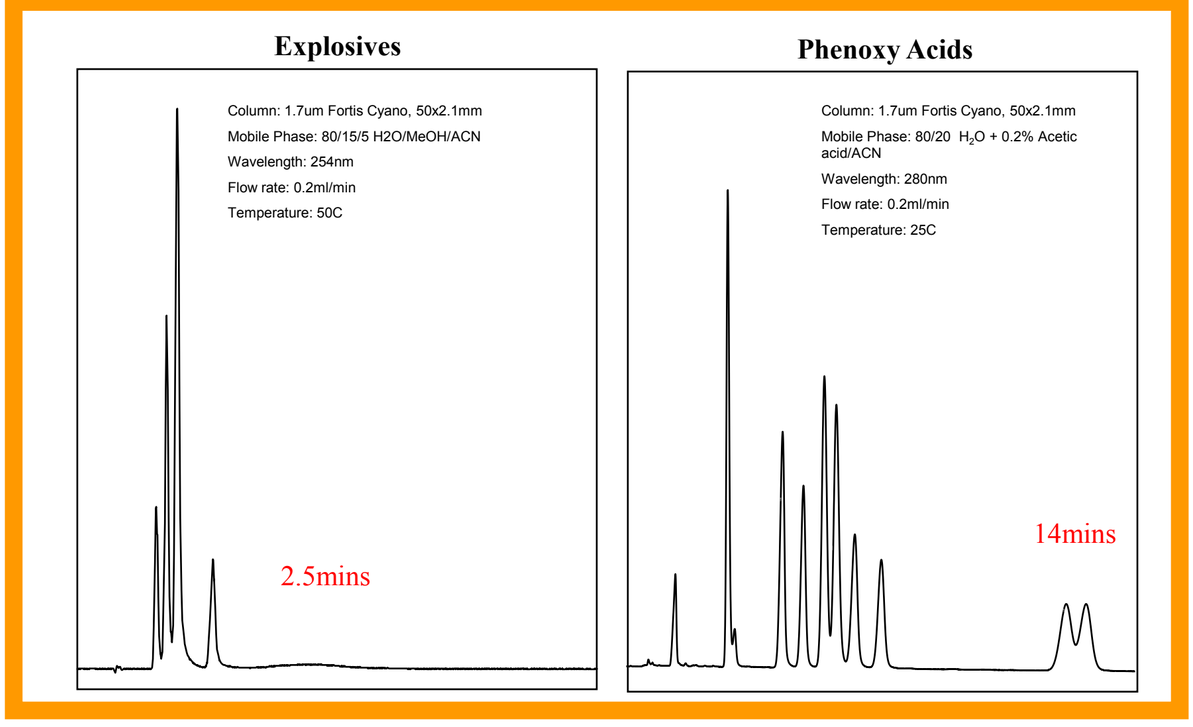


FIGURE 5. Making Use of Alternate Selectivity



Conclusion

By selection of correct stationary phase coupled with UHPLC technology we are able to improve compound identification in several environmental applications whilst also significantly reducing analysis time.

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