

Analysis of Explosives Using a Core Enhanced Technology Accucore HPLC Column

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Key Words

- Fused core
- Superficially porous
- Explosives
- Core Enhanced Technology
- Accucore C18 / PFP

Abstract

This application note demonstrates the use of the Thermo Scientific Accucore C18 column for the fast analysis of explosives.

Introduction

Accucore™ HPLC columns use Core Enhanced Technology to facilitate fast and high efficiency separations. The 2.6 µm diameter particles are not totally porous, but rather have a solid core and a porous outer layer. The optimised phase bonding creates a series of high coverage, robust phases. The tightly controlled 2.6 µm diameter of Accucore particles results in much lower backpressures than typically seen with sub-2 µm materials.

Explosives are environmental toxins, regulated in EPA 8330. Here we compare the separation of a sub-set of the compounds covered by the EPA method, using a C18 and a perfluorinated phenyl (PFP) HPLC column.

Results

The Accucore C18 column demonstrated a separation of 5 explosive compounds in less than 3 minutes. This is in comparison with an 8 minute separation using the same conditions, on an equivalent PFP column. The different selectivity exhibited by the PFP column is believed to be a result of pi-pi interactions, which do not occur with conventional alkyl chain HPLC packings, such as C18.

Conclusions

The Accucore C18 column provides a good separation of 5 explosive compounds. This is achieved in less than 3 minutes. The Accucore PFP provides different selectivity to the C18 chemistry and could lend itself as a confirmatory column for these compounds.



Sample Preparation

1,3,5-trinitrobenzene (1.0 mg), 1,3-dinitrobenzene (1.2 mg), nitrobenzene (2.1 mg), 2,4,6-trinitrotoluene (1.0 mg) and 2,4-dinitrotoluene (1.7 mg) were each dissolved in 1.0 mL methanol/water (50:50). Each of the explosive solutions (100 µL) were mixed and made up to 1000 µL with methanol/water (50:50).

Thermo Scientific Column	Part Number
Accucore C18 2.6 µm 100 x 2.1 mm	17126-102130
Accucore PFP 2.6 µm 100 x 2.1 mm	17426-102130
Measured backpressure: 264 bar	

Thermo Scientific HPLC System

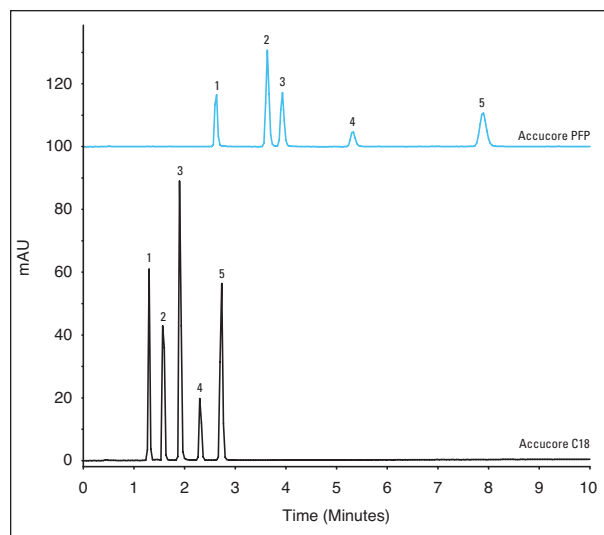
Column temperature	40 °C
Injection volume	1.0 µL
Flow rate	0.4 mL/min
UV detection	254 nm

Mobile Phase

Water/Methanol (60:40)

Consumables	Part Number
Fisher Scientific HPLC grade water	W/0106/17
Fisher Scientific HPLC grade methanol	M/4056/17
NSC Mass Spec Certified 2 mL clear vial with blue bonded PTFE silicone cap	MSCERT4000-34W

Figure 1: The separation of 5 explosives on Accucore C18 and PFP columns.
 Compounds: 1. 1,3,5-trinitrobenzene 2. nitrobenzene 3. 1,3-dinitrobenzene 4. 2,4,6-trinitrotoluene 5. 2,4-dinitrotoluene



	t_r /min	A_s	N
Mean	7.86	1.11	14351
SD	0.03	0.10	349.9
%CV	0.35	8.6	2.4

Table 1: Method precision - using retention time, asymmetry and the efficiency of peak 5 and derived from 6 replicate injections

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