UHPLC Analysis of DNPH Derivatised Carbonyl Compounds

ACE® Ultra-inert UHPLC & HPLC Columns

Application: #EN0005

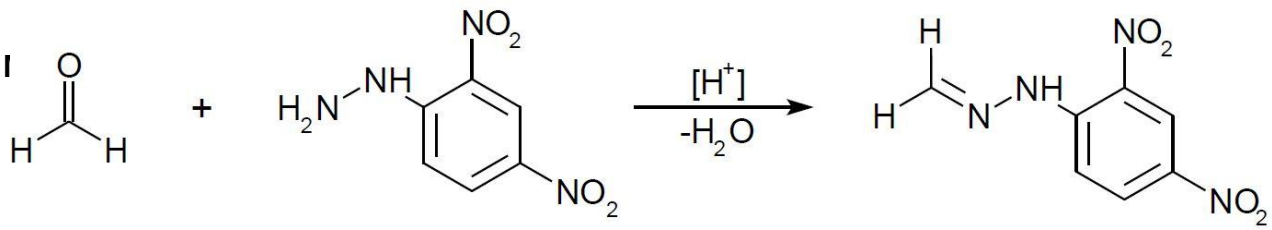
Introduction

Certain carbonyl compounds, such as ketones and aldehydes, are recognised as atmospheric pollutants which can be hazardous to human health. They are generated from several different sources such as exhaust fumes, cigarette smoke and other industrial processes.[1] Acetaldehyde and formaldehyde are identified as two of the most toxic aldehydes, with formaldehyde being classified as carcinogenic.[2]

It is therefore important to be able to identify and quantify these compounds in air and other potential sources such as soil or water. Due to the thermal instability, volatility, limited UV activity and slightly polar nature of some carbonyl compounds, derivatisation with 2,4-dinitrophenylhydrazine (DNPH) is frequently used to allow a reversed-phase separation with UV detection.[3]

Several official regulatory methods are typically used for the measurement of DNPH derivatised carbonyls in a range of sample matrices (e.g. EPA 554, TO-11 and CARB-1004). Commonly, these HPLC-UV methods require extremely long run times (often up to 60 min) in order to achieve the desired resolution within complex samples.

This application note demonstrates the separation of 14 carbonyl compounds included in a commercially available CARB Method 1004 test mix using sub-2 µm ACE Excel UHPLC particles. The separation was achieved in under 6 minutes, substantially reducing the analysis time compared to many official regulatory methods The use of smaller particle sizes increases the efficiency of the separation and allows higher flow rates to be employed whilst maintaining equivalent peak resolution. The use of a UHPLC instrument for this method meant that the high pressures associated with higher flow rates were not an issue.



[1] Levart, A.; Veber, M. (2001) Determination of aldehydes and ketones in air samples using cryotrapping sampling, *Chemosphere*, **44** (4), 701-708.
[2] Uchiyama, S.; Inaba, Y.; Kunugita, N. (2011) Derivatization of carbonyl compounds with 2,4-dinitrophenylhydrazine and their subsequent determination by high-performance liquid chromatography, *J. Chromatogr. B Analyt. Technol. Biomed. Life Sci.* **879** (17-18), 1282-1289.
[3] Miller IV J., Gardner W., Gonzalez R. (2010) UHPLC Separation with MS Analysis for Eight Carbonyl Compounds in Mainstream Tobacco Smoke, *J. Chromatogr. Sci.*, **48**, 12-17.

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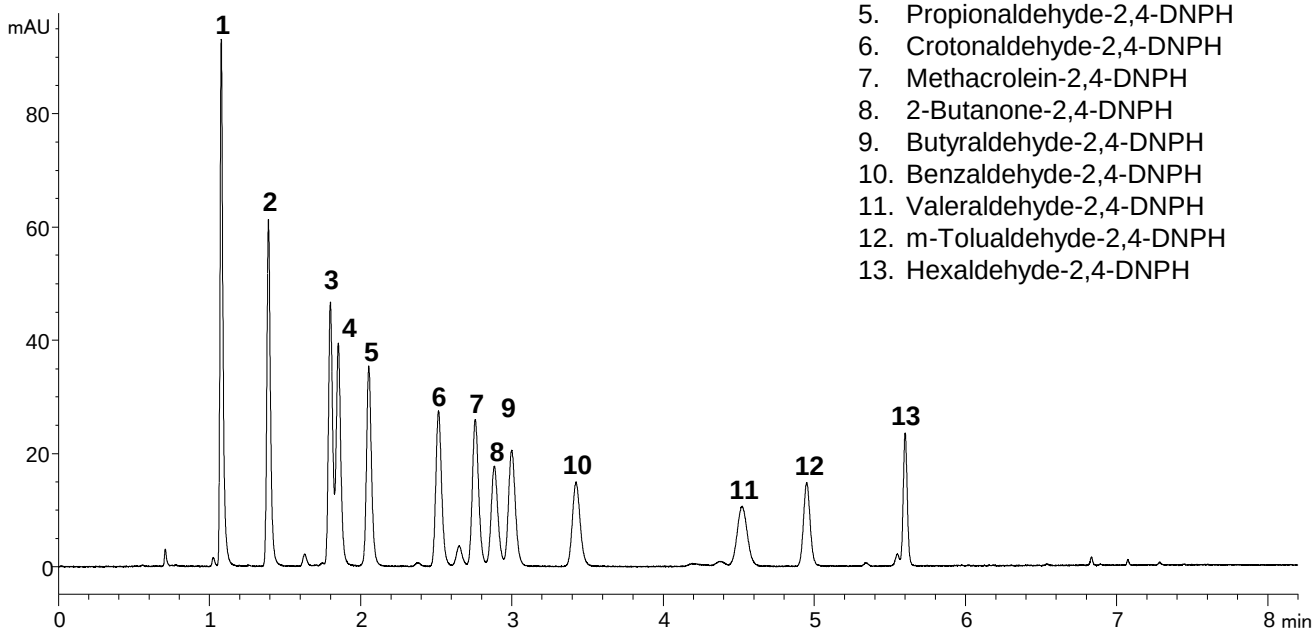
Conditions

Column:	ACE Excel 1.7 C18
Dimensions:	100 x 3.0 mm
Part Number:	EXL-171-1003U
Mobile Phase:	A: H_2O
	B: MeCN

Time (mins)	%B
0.0	55
4.0	55
7.0	100
8.0	100
8.2	55
13.2	55

Flow Rate:	1 mL/min
Injection:	1 µL
Temperature:	50 °C
Detection:	UV, 365 nm
Sample:	CARB Method 1004 Test Mix

1. Formaldehyde-2,4-DNPH
2. Acetaldehyde-2,4-DNPH
3. Acrolein-2,4-DNPH
4. Acetone-2,4-DNPH
5. Propionaldehyde-2,4-DNPH
6. Crotonaldehyde-2,4-DNPH
7. Methacrolein-2,4-DNPH
8. 2-Butanone-2,4-DNPH
9. Butyraldehyde-2,4-DNPH
10. Benzaldehyde-2,4-DNPH
11. Valeraldehyde-2,4-DNPH
12. m-Tolualdehyde-2,4-DNPH
13. Hexaldehyde-2,4-DNPH



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