

# APPLICATIONS

## Underivatized Reversed Phase Retention and Separation of 13 Carbonyl Compounds with the Kinetex<sup>®</sup> Biphenyl HPLC/UHPLC Column

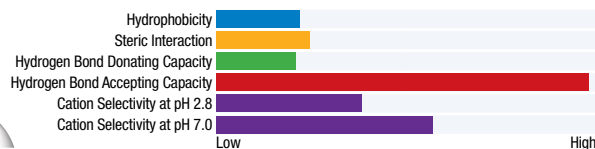
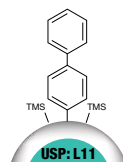
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### Overview

The formation of low molecular weight carbonyl compounds can be associated with both natural and synthetic chemical processes. Because of their relative abundance and established effect as primary or secondary pollutants, carbonyls are monitored in a variety of matrixes.<sup>1</sup> In order to accurately and consistently quantify these compounds, several methods have been proposed that employ HPLC.<sup>2</sup>

However, the analysis of these low molecular weight aldehydes and ketones by reversed phase HPLC presents certain analytical challenges. Because of their relative polarity, reversed phase retention and selectivity can be problematic. Several proposed methodologies rely on the use of the derivatization agent 2,4-dinitrophenylhydrazine (DNPH) to improve chromatographic retention and selectivity.<sup>3</sup>

This application is an alternative HPLC method for the analysis of 13 carbonyls without the use of any derivatization agent. The method uses the combined polar and non-polar selectivity of a Kinetex Biphenyl stationary phase to achieve improved chromatographic results. Retention and selectivity studies have correlated biphenyl functionalized stationary phases with increased polar selectivity for hydrophilic compounds due to increased capacity for hydrogen bonding.<sup>4</sup> In addition, the Kinetex solid support is a superficially porous (core-shell) particle morphology that provides ultra-high column efficiency on any HPLC/UHPLC system.<sup>5</sup>



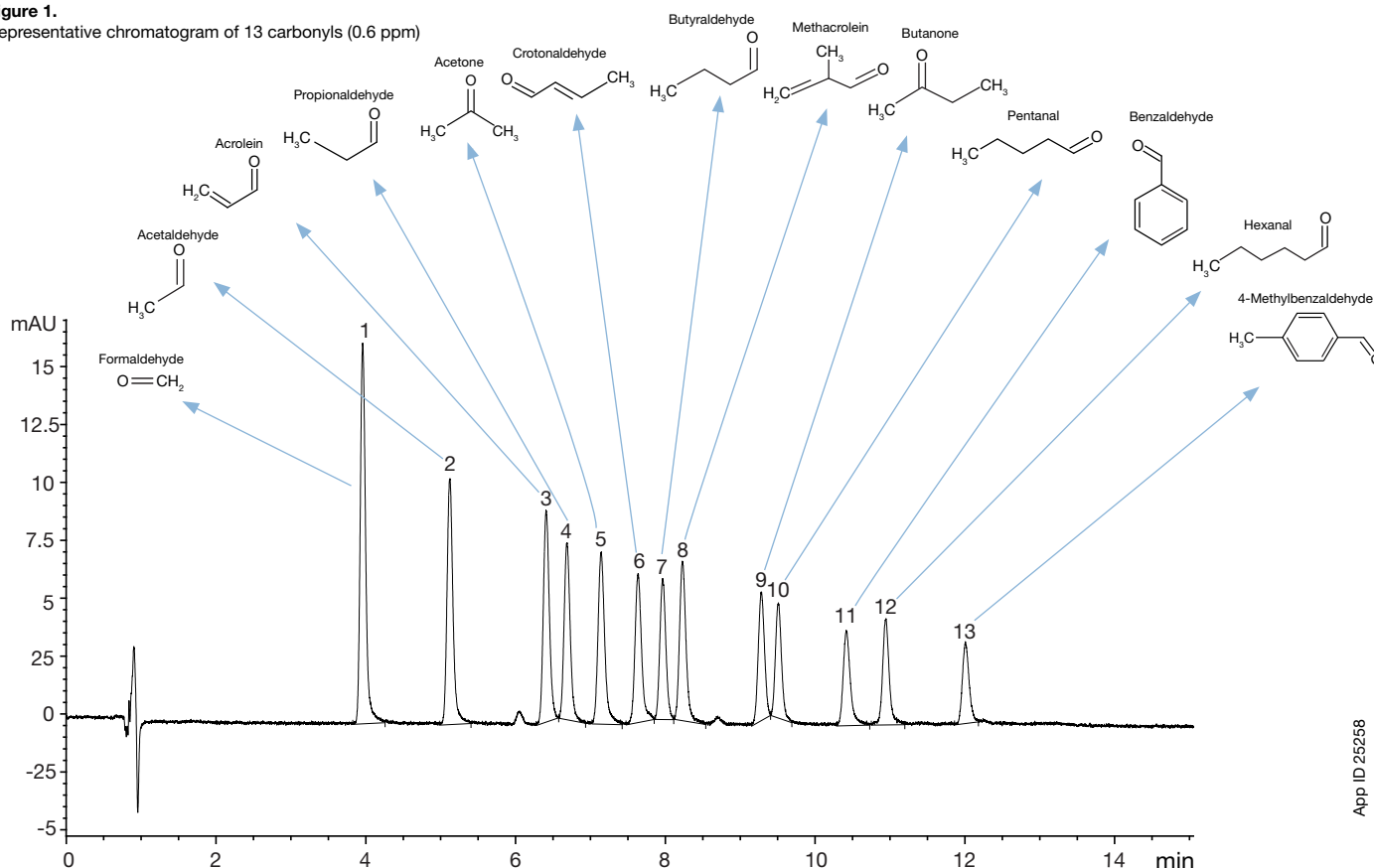
**Column:** Kinetex 2.6  $\mu$ m Biphenyl  
**Dimensions:** 100 x 4.6 mm  
**Part No.:** 00D-4622-E0  
**Mobile Phase:** A: Water  
B: Ethanol/Methanol (50:50)  
**Gradient:**

Time (min)	% B
0	60
0.5	60
12	75
13	75
13.5	60
15	60

**Flow Rate:** 1.3 mL/min  
**Injection Volume:** 5  $\mu$ L  
**Temperature:** 40  $^{\circ}$ C  
**Detection:** UV @ 360 nm  
**Sample:**

1. Formaldehyde	8. Methacrolein
2. Acetaldehyde	9. Butanone
3. Acrolein	10. Pentanal
4. Propionaldehyde	11. Benzaldehyde
5. Acetone	12. Hexanal
6. Crotonaldehyde	13. 4-Methylbenzaldehyde
7. Butyraldehyde	

**Figure 1.**  
Representative chromatogram of 13 carbonyls (0.6 ppm)



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## Kinetex<sup>®</sup> Core-Shell LC Column Ordering Information

Kinetex 5 µm Columns (mm)		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>	
Phases	50 x 2.1	3/pk	50 x 3.0	3/pk	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	3/pk
Biphenyl	00B-4627-AN	AJO-9209	00B-4627-YO	AJO-9208	00B-4627-E0	00D-4627-E0	00F-4627-E0	00G-4627-E0	AJO-9207
		for 2.1 mm ID		for 3.0 mm ID					for 4.6 mm ID

Kinetex 2.6 µm Columns (mm)		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>		SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>	
Phases	50 x 2.1	100 x 2.1	3/pk	50 x 3.0	3/pk	50 x 4.6	100 x 4.6	150 x 4.6	3/pk
Biphenyl	00B-4622-AN	00D-4622-AN	AJO-9209	00B-4622-YO	AJO-9208	00B-4622-E0	00D-4622-E0	00F-4622-E0	AJO-9207
			for 2.1 mm ID		for 3.0 mm ID				for 4.6 mm ID

Kinetex 1.7 µm Columns (mm)				SecurityGuard <sup>™</sup> ULTRA Cartridges <sup>†</sup>
Phases	50 x 2.1	100 x 2.1	150 x 2.1	3/pk
Biphenyl	00B-4628-AN	00D-4628-AN	00F-4628-AN	AJO-9209
				for 2.1 mm ID

<sup>†</sup> SecurityGuard ULTRA cartridges require holder, Part No. AJO-9000.

## References

1. Committee on Aldehydes, Board of Toxicology and Environmental Hazards, National Research Council, Formaldehyde and Other Aldehydes; National Academy Press, Washington, DC, **1981**
2. California EPA Air Resource Board, Determination of Formaldehyde and Acetaldehyde in Emissions from Stationary Sources Method 430, September **1989**.
3. U.S. Environmental Protection Agency, Determination of Carbonyl Compounds by High Performance Liquid Chromatography (HPLC), Method 8315A-1, December **1996**.
4. David Bell, Daniel Shollenberger, H. Cramer. Evaluation of retention and selectivity using biphenyl stationary phases. *LC-GC North America*. **2017**, 35(7), 360-365.
5. Fabrice Gritti, Georges Guiochon. Facts and Legends About Columns Packed with sub-3-µm Core-Shell Particles. *LC-GC North America*. **2012**, 30(7), 586-595.

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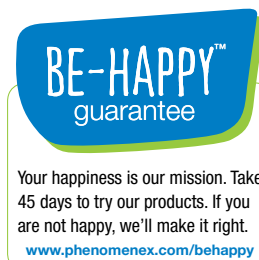
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