SHIMADZU

Nexera
Ultra High Performance Liquid Chromatograph

Nexera Application Data Sheet No.13

Ultrafast Analysis of Aldehydes and Ketones

Aldehydes and ketones in the environment can be analyzed using HPLC by derivatizing them with 2,4-dinitrophenylhydrazine (2,4-DNPH). For multicomponent separation of aldehyde/ketone DNPH derivatives, reverse-phase gradient elution is generally used. Nexera enables stable ultrafast gradient elution through accurate solution delivery and the use of a high-efficiency gradient mixer. This document introduces an example of ultrafast analysis performed on 13 aldehyde/ketone DNPH derivatives by gradient elution using Nexera and a Phenomenex Kinetex C18 column (particle size 2.6 μm, a core-shell column where a 0.35 μm porous membrane is combined with a 1.9 μm solid core).

### Batch analysis of 13 aldehyde/ketone DNPH derivatives by binary high-pressure gradient elution

A batch analysis was performed on standard mixtures (1 μg/mL and 5 μL injection each) by binary high-pressure gradient elution with water/THF mixture and acetonitrile. In this analysis, the repeatability (n = 6, %RSD) of the retention time and peak area of formaldehyde-DNPH derivatives were 0.087 % and 0.16 % respectively, showing Nexera's high-accuracy gradient performance.
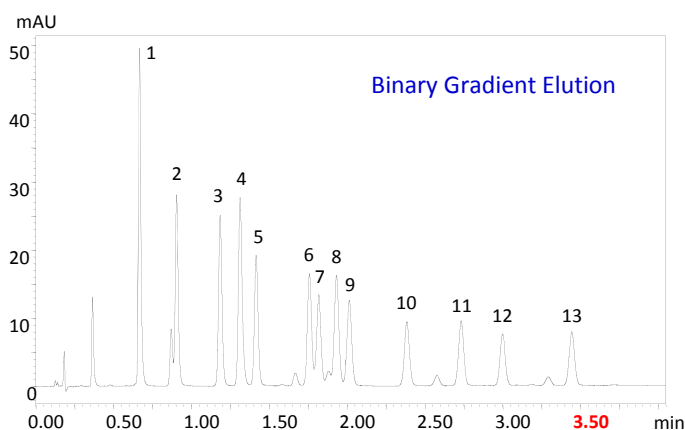
Column	: Phenomenex Kinetex 2.6 μm C18 100 Å (50 mmL. x 3.0 mmI.D., 2.6 μm)
Mobile phase	: A: Water/THF=8/2 B: Acetonitrile
Gradient	: B 20 % (0 min)→50 % (4 min)
Flow rate	: 1.5 mL/min (Mixer 180 μL)
Column temp.	: 50 ℃
Injection volume	: 5 μL
Detection	: UV 360 nm
Flow cell	: Semi-micro cell

Batch analysis of 13 aldehyde/ketone DNPH derivatives by ternary high-pressure gradient elution

Nexera's modular design enables various systems to be configured, such as a high-pressure gradient elution system with up to three solutions or a low-pressure gradient elution system with up to four solutions. Below is an example where standard mixtures (1 μg/mL and 2 μL injection each) were efficiently analyzed in a shorter time using ternary high-pressure gradient elution.
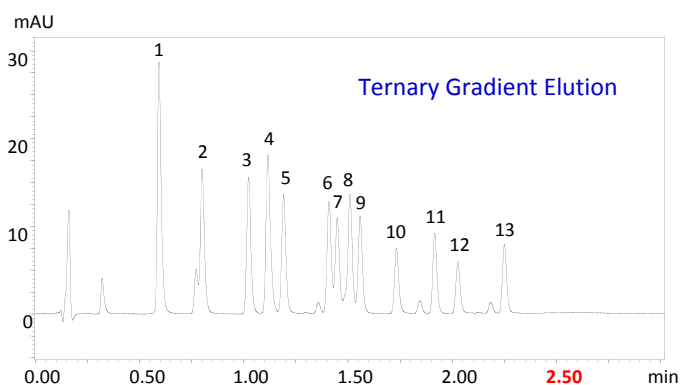
Column	: Phenomenex Kinetex 2.6 μm C18 100 Å (50 mmL. x 2.0 mmI.D., 2.6 μm)

Mobile phase	: A: Water
	  B: Acetonitrile
	  C: THF

Gradient	: B 20 % (0 min)→50 % (2.0-2.4 min) C 15 % (0 min)→10 % (2.0-2.4 min)
Flow rate	: 0.9 mL/min (Mixer 180 μL)
Column temp.	: 50 ℃
Injection volume	: 2 μL
Detection	: UV 360 nm
Flow cell	: Semi-micro cell

Peaks:
1. Formaldehyde, 2. Acetaldehyde, 3. Acetone, 4. Acrolein, 5. Propionaldehyde, 6. Crotonaldehyde, 7. 2-Butanone, 8. Methacrolein, 9. n-Butyraldehyde, 10. Benzaldehyde, 11. Valeraldehyde, 12. m-Tolualdehyde, 13. Hexaldehyde (as their 2,4-DNPH derivatives)