COSMOSIL

Silica gel columns for UHPLC

COSMOSIL 1.8C_{18}-MS- II / COSMOCORE 2.6C_{18}

- **Two C_{18} columns for UHPLC separation**
- **Well-balanced selectivity for general-purpose separations**
- **Stable lot-to-lot quality and superior separation**

Fast analysis by UHPLC

Ultra-high performance liquid chromatography (UHPLC) is a technology for speeding up analysis by using columns packed with smaller silica gel particles than standard HPLC and flowing mobile phase at a high rate. Analyses by UHPLC are increasing in number every year, and it is sure to continue to be an important technology in years to come.

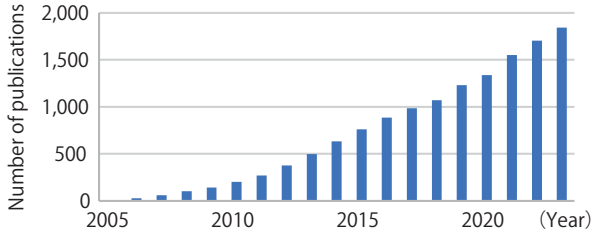


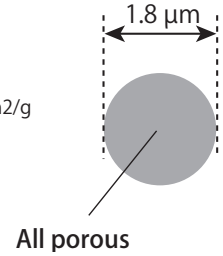
Fig. 1. Number of publications using UHPLC (2005 to 2023)

Number of publications with "UPLC" or "UHPLC" in the title, abstract, or keywords, as searched on www.sciencedirect.com

Our UHPLC columns include COSMOSIL 1.8C_{18}-MS-II, made with fully porous silica, and COSMOCORE 2.6C_{18}, made with core-shell silica. Users should choose the appropriate column based on their instrument and analysis requirements. This pamphlet lists some characteristics of each column.

Fully porous silica (COSMOSIL 1.8C_{18}-MS-II)

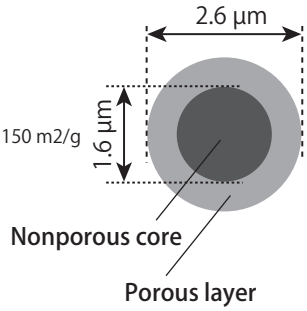
Pore size: about 12 nm
Specific surface area: about 340 m2/g
Max. pressure: 80 MPa
Usable pH range: 2–10*



Because the fully porous silica has pores throughout its structure, it can interact with the sample over a very wide surface area. As the amount of octadecyl phase that can be bonded increases, hydrophobic samples can be retained longer, leading to improved separation.

Core-shell silica (COSMOCORE 2.6C_{18})

Pore size: about 9 nm
Specific surface area: about 150 m2/g
Max. pressure: 60 MPa
Usable pH range: 2–10*



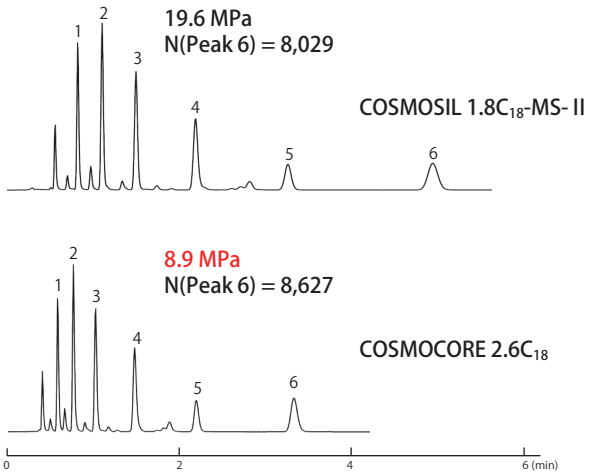
With core-shell silica's nonporous core, sample dispersion is reduced; compared to fully porous columns, high theoretical plate numbers can be achieved even with larger particles. These larger particles result in lower backpressure, enabling use on conventional HPLC instruments.

*Silica gel columns are generally recommended to be used within pH 2–7.5. Outside this range, column degradation may happen more quickly.

Comparison of fully porous and core-shell columns

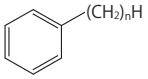
UHPLC columns exhibit very high numbers of theoretical plates, so good separation can be achieved even on short columns.

● Retention of alkylbenzenes



Compared to COSMOCORE 2.6C_{18}, COSMOSIL 1.8C_{18}-MS-II has stronger hydrophobic interactions, so retention for hydrophobic compounds is longer. COSMOCORE 2.6C_{18} has lower backpressure, resulting in lower load on the instrument. In addition to UHPLC, it can be used on conventional HPLC instruments.

< Sample >



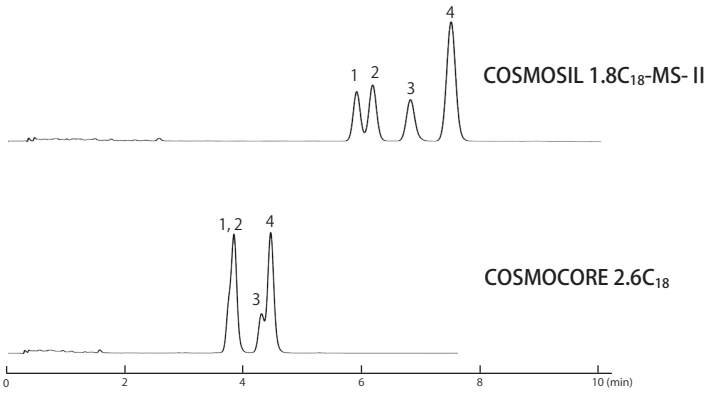
1. Benzene (n=0)
2. Toluene (n=1)
3. Ethylbenzene (n=2)
4. Propylbenzene (n=3)
5. Butylbenzene (n=4)
6. Amylbenzene (n=5)

< Conditions >

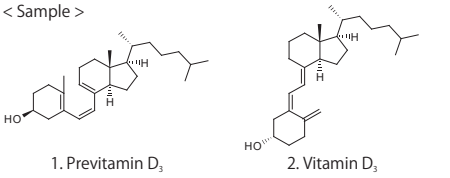
Column size:	2.1 mm I.D. × 50 mm	Flow rate:	0.4 mL/min	Detection:	UV 254 nm
Mobile phase:	Acetonitrile / H_2O = 60 / 40	Temperature:	40℃		

● Separation of structural isomers of vitamin D

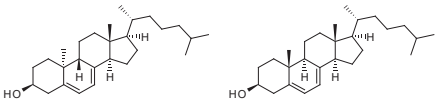
COSMOSIL 1.8C_{18}-MS-II has strong retention and selectivity for hydrophobic compounds, so it can separate these structural isomers of vitamin D. The C_{18}-MS-II series has particle sizes of 1.8, 2.5, 3, 5, and 15 µm available, so scaling up to preparative separation is a smooth process.



< Sample >



1. Previtamin D_3
2. Vitamin D_3



3. Lumisterol
4. 7-Dehydrocholesterol(7-DHC)

This sample was prepared by mixing the below in a 1:3 ratio:
- 0.25 mg/mL Vitamin D_3 in Methanol
- 0.25 mg/mL 7-DHC in Methanol, exposed to 254 nm UV light for 30 min.

< Conditions >

Column size:	2.1 mm I.D. × 50 mm	Flow rate:	0.4 mL/min	Detection:	UV 265 nm
Mobile phase:	Methanol / H_2O = 90 / 10	Temperature:	40℃		

- **For analyses that require strong hydrophobic interactions**
- **For moving methods from HPLC to UHPLC, or scaling up to preparative separation**

Fully porous column for UHPLC

COSMOSIL 1.8C_{18}-MS-II

- **Keeps backpressure low**
- **For use with conventional HPLC instruments**

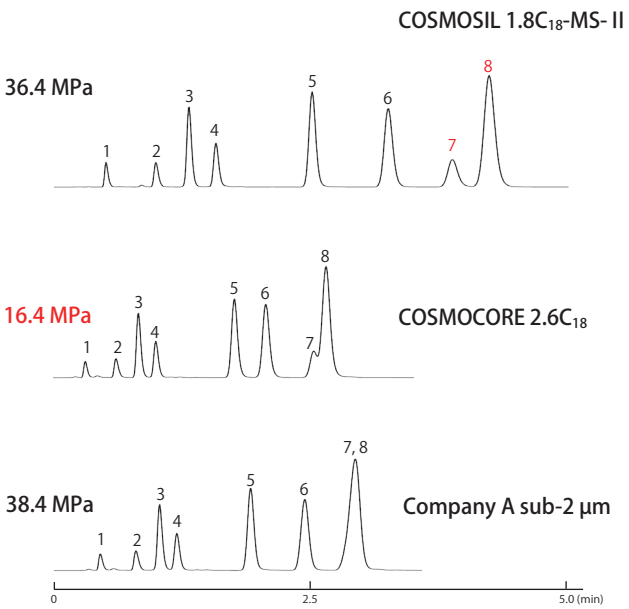
Core-shell column for UHPLC

COSMOCORE 2.6C_{18}

Comparison to competitor columns

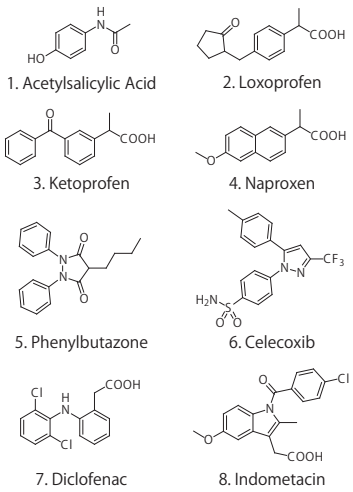
COSMOSIL 1.8C_{18}-MS-II and COSMOCORE 2.6C_{18} were compared to a competitor UHPLC column. COSMOSIL 1.8C_{18}-MS-II, with its high retention for hydrophobic compounds, is able to separate compounds that the competitor column was not able to separate. COSMOCORE 2.6C_{18} is similar in retention and selectivity to the competitor column, but ran with less than half the backpressure.

● Drug analysis (NSAIDs)



COSMOSIL 1.8C_{18}-MS-II, with its high hydrophobicity and selectivity, was able to separate difficult compounds.

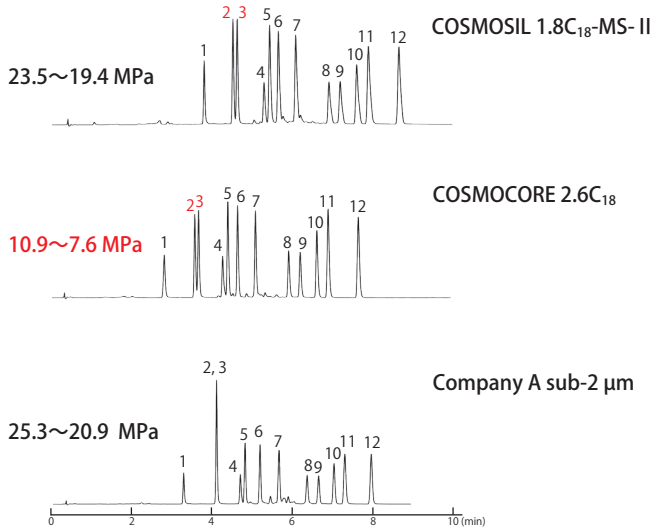
< Sample >



< Conditions >

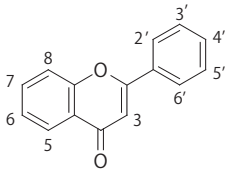
Column size:	2.1 mm I.D. × 50 mm	Temperature:	40℃
Mobile phase:	Methanol / 0.1% HCOOH aq. = 60 / 40	Detection:	UV 260 nm
Flow rate:	0.4 mL/min		

● Flavonoid analysis



Compared to isocratic elution, in this gradient elution, the differences in retention time between the columns was small, and elution order was the same. However, COSMOSIL 1.8C_{18}-MS-II and COSMOCORE 2.6C_{18} were still able to separate compounds that were not separated on the competitor column.

< Sample >



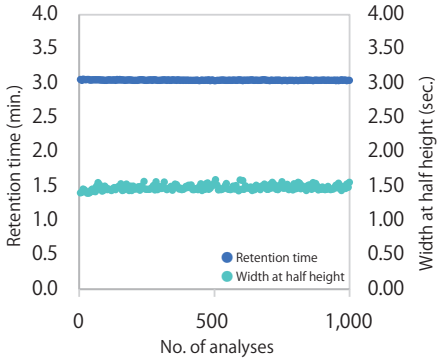
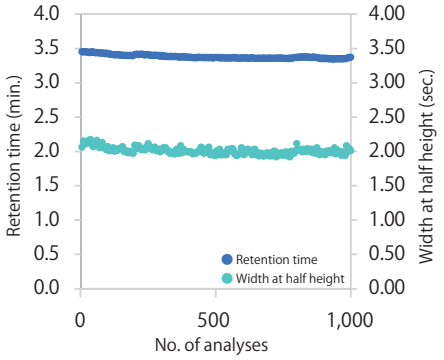
No.	Compounds	3	5	6	7	8	2′	3′	4′	5′	6′
1.	Myricetin	OH	OH		OH			OH	OH	OH	
2.	7,8-Dihydroxyflavone				OH	OH					
3.	Quercetin	OH	OH		OH			OH	OH		
4.	Apigenin		OH		OH				OH		
5	Kaempferol	OH	OH		OH				OH		
6.	7-Hydroxyflavone				OH						
7.	6-Hydroxyflavone			OH							
8.	Flavone										
9.	Chrysin		OH		OH						
10.	6-Methoxyflavone			OCH_3							
11.	3-Hydroxyflavone	OH									
12.	5-Hydroxyflavone		OH								

< Conditions >

Column size:	2.1 mm I.D. × 50 mm	Flow rate:	0.4 mL/min
Mobile phase:	A: 0.1% Formic Acid -in Water B: 0.1% Formic Acid - in Acetonitrile B conc. 10 → 70% 10 min Linear gradient	Temperature:	40℃
		Detection:	UV 280 nm
		Inj. Vol.:	1.0 µL

Durability of UHPLC columns

UHPLC columns are routinely exposed to high pressures. To evaluate the durability of these columns, amitriptyline was injected 1,000 times into each column. Neither COSMOSIL 1.8C_{18}-MS-II nor COSMOCORE 2.6C_{18} saw deterioration in retention time or peak shape (width at half height).

COSMOSIL 1.8C_{18}-MS-II	COSMOCORE 2.6C_{18}
	

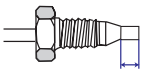
< Conditions >

Column size:	2.1 mm I.D. × 50 mm	Temperature:	40℃
Mobile phase:	A: 0.1% TFA in Water B: 0.1% TFA in Acetonitrile B conc. 5 → 90% (0.00 - 3.00 min), 90 → 5% (3.00 - 3.01 min), 5%(3.01 – 6.00 min)	Detection: Sample: Inj. Vol.:	UV 236 nm Amitriptyline (0.2 mg/mL) 1.0 µL
Flow rate:	0.4 mL/min		

Please see the below resources for more information:

☞ • COSMOSIL C_{18}-MS-II
(https://www.nacalai.co.jp/cosmosil/column/C18-MS.html)
• COSMOCORE 2.6C_{18}
(https://www.nacalai.co.jp/cosmosil/column/COSMOCORE.html)
☞ • COSMOSIL Application
(https://www.nacalai.co.jp/cosmosil/data/csmosrchtop.cfm)

【Note on connector type:】
Our UHPLC columns use the same connectors as Waters UPLC® (UHPLC) columns. This is different from our conventional COSMOSIL columns, which use the conventional Waters HPLC-compatible connectors. Attempting to connect an unsuitable fitting may result in it becoming stuck in the column.



Ordering information

● COSMOSIL 1.8C_{18}-MS-II Analytical Columns（Particle Size: 1.8 µm）
Packed Column

I.D. x Length (mm)	Product Number
2.1 × 30	22132-71
2.1 × 50	22136-31

I.D. x Length (mm)	Product Number
2.1 × 75	22137-21
2.1 × 100	22138-11

I.D. x Length (mm)	Product Number
2.1 × 150	22139-01

● COSMOCORE 2.6C_{18} Analytical Columns（Particle Size: 2.6 µm）
Packed Column

I.D. x Length (mm)	Product Number
2.1 × 30	12632-31
2.1 × 50	12631-41
2.1 × 75	12630-51
2.1 × 100	12614-71
2.1 × 150	12612-91

I.D. x Length (mm)	Product Number
3.0 × 30	12611-01
3.0 × 50	12609-51
3.0 × 75	12608-61
3.0 × 100	12607-71
3.0 × 150	12602-21

I.D. x Length (mm)	Product Number
4.6 × 30	12601-31
4.6 × 50	12600-41
4.6 × 75	12599-91
4.6 × 100	12598-01
4.6 × 150	12597-11
4.6 × 250	12596-21

nacalai tesque
The quality for certainty.

NACALAI TESQUE, INC.
Nijo Karasuma, Nakagyo-ku,
Kyoto 604-0855 JAPAN
TEL: +81-(0)75-251-1730
Website: www.nacalai.com
E-mail: info.intl@nacalai.com