

12. SFC (Supercritical Fluid Chromatography) Columns

COSMOSIL SFC Column Series



- Three categories of stationary phase for different types of compounds
- Different selectivity from HPLC

Products

Category I: Columns for mid- to high-polarity compounds

For these compounds, a high-polarity stationary phase is suitable. More polar compounds are retained longer.

Product Name	Bonded Phase	Features
COSMOSIL PY	Pyridinyl group	Similar selectivity to 2-ethylpyridine; strong retention in general.
COSMOSIL HP	3-Hydroxyphenyl group	Different selectivity from PY; strong retention for basic compounds.
COSMOSIL Diol	Diol group	Less effect from ionic interaction.

Category II: Columns for low-polarity compounds

For these compounds, a low-polarity stationary phase is suitable.

Product Name	Bonded Phase	Features
COSMOSIL Cholester	Cholesteryl group	Longer retention and better separation than C ₁₈ .

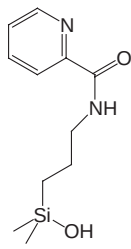
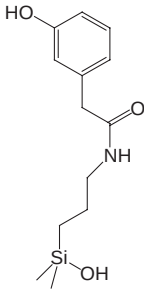
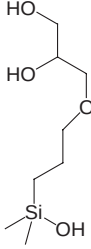
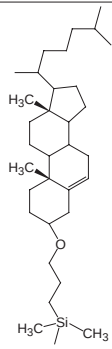
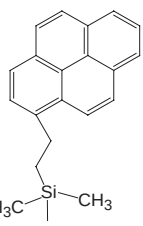
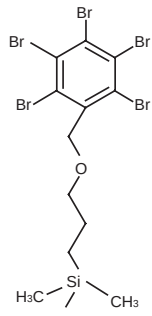
Category III: Columns for SFC-specific separations

In supercritical fluid chromatography (SFC), secondary interactions such as π - π and dispersion force* are stronger compared to high-performance liquid chromatography (HPLC). As a result, these columns are capable of unique separations in SFC.

Product Name	Bonded Phase	Features
COSMOSIL π MAX	Pyrenylethyl group	Stronger π - π interaction than phenyl column.
COSMOSIL PBr	Pentabromobenzyl group	Unique separations using dispersion force.*

* Dispersion force: London dispersion force is a weak intermolecular force that results from dipoles temporarily induced from random unsymmetrical electron positions in two adjacent atoms, also known as "instantaneous dipole-induced dipole force". It is present in all molecules, regardless of whether they are polar or non-polar. Compounds with high polarizability have stronger dispersion force.

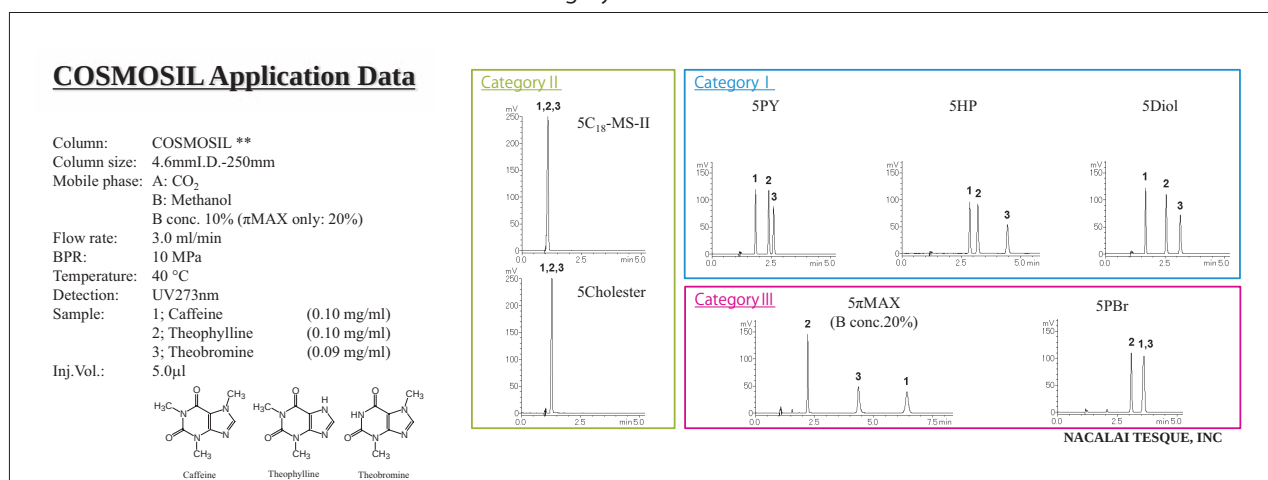
Specifications

Packing Material	PY	HP	Diol	Cholester	π MAX	PBr
Silica Gel	High purity porous spherical silica					
Average Particle Size	3, 5 μ m					
Average Pore Size	120 Å					
Bonded Phase Structure						
Bonded Phase	Pyridinyl group	3-Hydroxyphenyl group	Diol group	Cholesteryl group	Pyrenylethyl group	Pentabromobenzyl group
End-Capping	Near-perfect treatment					

Applications

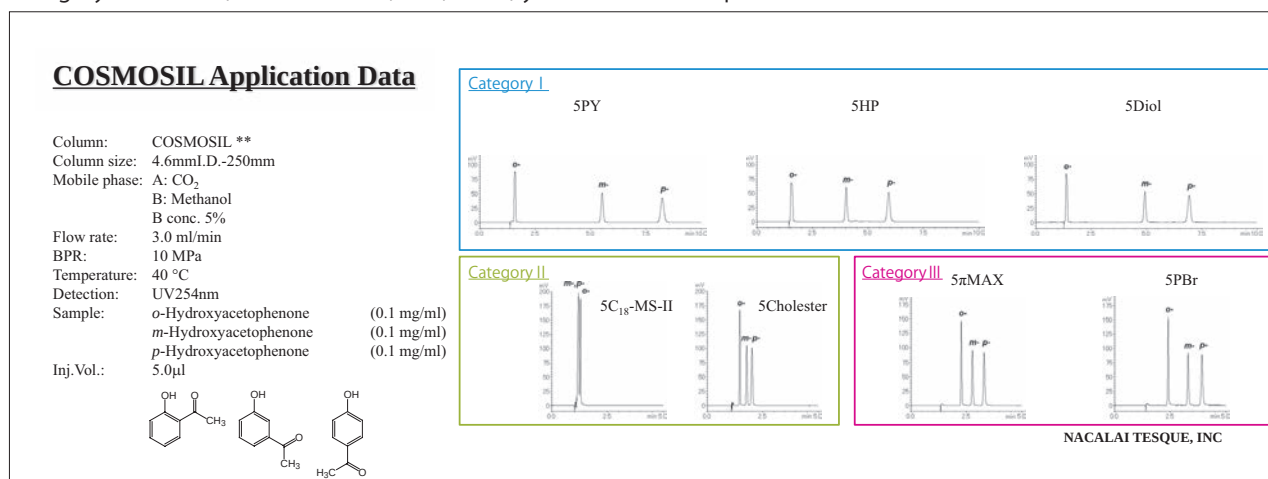
- Derivatives of xanthine (high-polarity compounds); XLogP3: -0.8 ~ 0.0

Category I columns (COSMOSIL 5PY, 5HP, 5Diol) and COSMOSIL 5 π MAX separated the sample well. The elution order with COSMOSIL 5 π MAX was different than the category I columns.



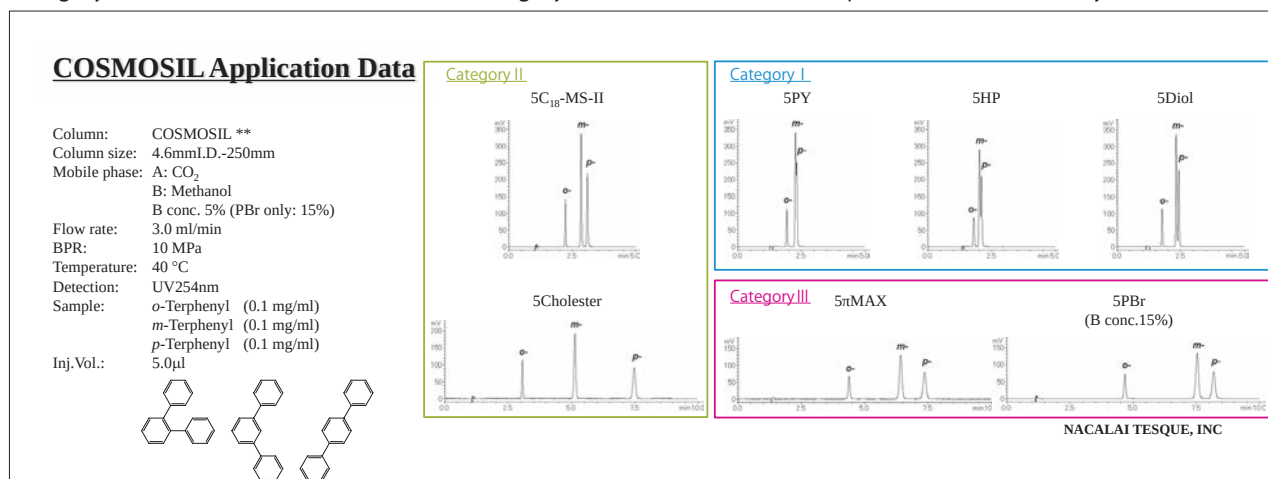
- Positional isomers (mid-polarity compounds); XLogP3: 1.4 ~ 1.9

Category I columns (COSMOSIL 5PY, 5HP, 5Diol) yielded the best separation.



- Positional isomers (low-polarity compounds); XLogP3: 5.8 ~ 6.0

Category III (COSMOSIL 5 π MAX, 5PBr) and category II (5Cholester) columns separated most effectively.



Applications

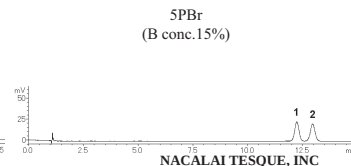
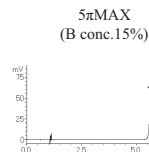
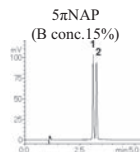
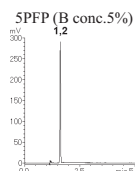
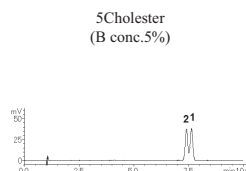
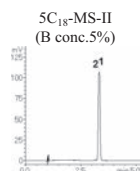
● Vitamin D

COSMOSIL 5 π MAX and 5PBr were able to separate the vitamins. The PFP (pentafluorophenyl) column, which also uses a halogenated stationary phase, could not separate them. The dispersion force used by PBr interacts more strongly with larger molecules. PFP, which is a smaller molecule, does not exhibit this selectivity.

COSMOSIL Application Data

Column: COSMOSIL **
 Column size: 4.6mm I.D.-250mm
 Mobile phase: A: CO₂
 B: Methanol
 B conc. **%
 Flow rate: 3.0 ml/min
 BPR: 10 MPa
 Temperature: 40 °C
 Detection: UV265nm

Sample: 1: Vitamin D₃ (0.6 mg/ml)
 2: Vitamin D₂ (0.6 mg/ml)
 Inj. Vol.: 3.0 μ l



NACALAI TESQUE, INC

● Nucleobases

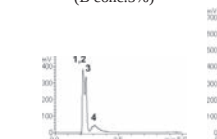
COSMOSIL 5Diol separated 5 nucleic acid bases.

COSMOSIL Application Data

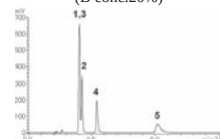
Column: COSMOSIL **
 Column size: 4.6mm I.D.-250mm
 Mobile phase: A: CO₂
 B: 100mmol/l Ammonium Acetate - Methanol
 B conc. **%
 Flow rate: 3.0 ml/min
 BPR: 10 MPa
 Temperature: 40 °C
 Detection: UV260nm

Sample: 1: Thymine (0.2 mg/ml)
 2: Uracil (0.2 mg/ml)
 3: Adenine (0.2 mg/ml)
 4: Cytosine (0.2 mg/ml)
 5: Guanine (0.2 mg/ml)
 Inj. Vol.: 5.0 μ l

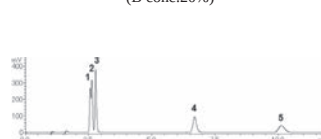
5C₁₈-MS-II
(B conc. 5%)



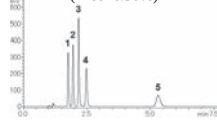
5PY
(B conc. 20%)



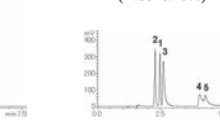
5HP
(B conc. 20%)



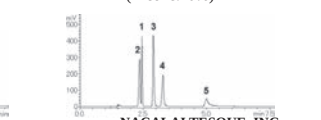
5Diol
(B conc. 30%)



5 π MAX
(B conc. 10%)



5PBr
(B conc. 10%)



NACALAI TESQUE, INC

● Polystyrene

These polystyrene samples with different degrees of polymerization are likely separated by number of monomer units. COSMOSIL 5 π MAX and 5PBr were able to separate the high-MW polystyrene.

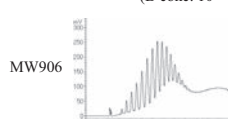
COSMOSIL Application Data

Column: COSMOSIL **
 Column size: 4.6mm I.D.-250mm
 Mobile phase: A: CO₂
 B: Tetrahydrofuran
 B conc. *→**% 10min Linear gradient
 Flow rate: 3.0 ml/min
 BPR: 10 MPa
 Temperature: 40 °C
 Detection: UV220nm

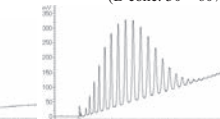
Sample: Polystyrene, MW906 (5.0 mg/ml)
 Polystyrene, MW2200 (5.0 mg/ml)
 Inj. Vol.: 5.0 μ l



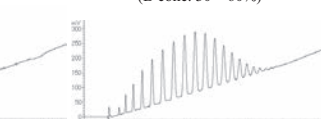
5C₁₈-MS-II
(B conc. 10→40%)



5 π MAX
(B conc. 30→60%)



5PBr
(B conc. 30→60%)



MW906

MW2200

NACALAI TESQUE, INC

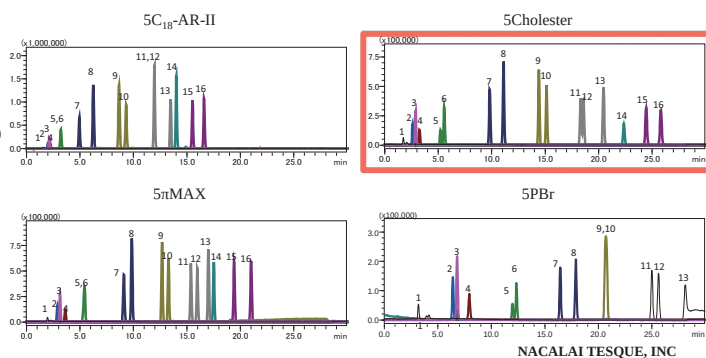
Applications

● Polyaromatic Compounds

COSMOSIL Application Data

Column: COSMOSIL **
 Column size: 4.6mm I.D.-250mm
 Mobile phase: A: CO₂
 B: Acetonitrile
 B conc. 5% (0-7min), 5 → 50% (20 → 22min), 50% (22-25min)
 Flow rate: 3.0 ml/min
 BPR: 10 MPa
 Temperature: 40 °C
 Detection: APCI-MS, Positive, MRM
 Sample:

1: Naphthalene	9: Benz[<i>a</i>]anthracene
2: Acenaphthylene	10: Chrysene
3: Acenaphthene	11: Benzo[<i>k</i>]fluoranthene
4: Fluorene	12: Benzo[<i>b</i>]fluoranthene
5: Anthracene	13: Benzo[<i>a</i>]pyrene
6: Phenanthrene	14: Dibenzo[<i>a,h</i>]anthracene
7: Fluoranthene	15: Indeno[1,2,3- <i>cd</i>]pyrene
8: Pyrene	16: Benzo[<i>g,h,i</i>]perylene



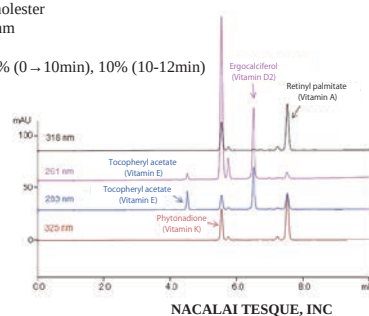
Data courtesy of SHIMADZU CORPORATION

AP-1634

● Fat-Soluble Vitamins

COSMOSIL Application Data

Column: COSMOSIL 5Cholester
 Column size: 4.6mm I.D.-250mm
 Mobile phase: IPA in CO₂
 IPA conc. 0 → 10% (0 → 10min), 10% (10-12min)
 Flow rate: 3.0 ml/min
 BPR: 15 MPa
 Temperature: 40 °C
 Detection: UV-VIS
 Sample conc: 2.0 mg/ml
 Inj. Vol.: 1.0 μl

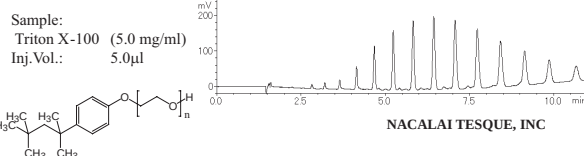


Data courtesy of SHIMADZU CORPORATION

● Surfactant

COSMOSIL Application Data

Column: COSMOSIL 5PBr
 Column size: 4.6mm I.D.-250mm
 Mobile phase: A: CO₂
 B: Methanol
 B conc. 2 → 100% 10min Linear gradient
 Flow rate: 2.0 ml/min
 BPR: 10 MPa
 Temperature: 40 °C
 Detection: UV220nm



Ordering Information

Bonded Phase	Packing Material											
	PY		HP		Diol		Cholester *		π MAX		PBr †	
Particle Size (mm I.D. × mm)	3 μm	5 μm	3 μm	5 μm	3 μm	5 μm	3 μm	5 μm	3 μm	5 μm	3 μm	5 μm
2.1 × 150	13557-01	13844-31	13559-81	13845-21	21567-21	18253-21	18556-61	13785-11	19596-11	18696-31	18875-81	13561-31
4.6 × 250	13558-91	13846-11	13560-41	13854-01		18252-31		13784-21		18372-61		13783-31
10 × 250		13780-61		13776-31		18678-71		13848-91		18679-61		13849-81
20 × 250		13782-41		13778-11		18869-71		13852-21		19587-31		13853-11
Guard Column 10 × 20		13781-51		13777-21				13850-41		18867-91		13851-31

Other packing material and column size are available, please contact us.

* For ordering information for COSMOSIL Cholester, refer to page 10.

† For ordering information for COSMOSIL PBr, refer to page 14.

(Pressure Limit)

- 2.1 mm I.D., 4.6 mm I.D., 10.0 mm I.D. : 30 MPa
- 20.0 mm I.D. : 23 MPa