



HICHROM

Chromatography Columns and Supplies

LC COLUMNS
Cosmosil

Catalogue 9

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- Spherical porous silica
- Monomeric and polymeric bonded C18
- Unique speciality bonded phases

Nacalai Tesque of Kyoto, Japan manufactures the COSMOSIL® range of columns. Their products include four C18 bonded phases and a number of unique speciality phases.

COSMOSIL Phases

Phase	Functional Group	Bonding	Particle Size (µm)	Pore Size (Å)	Surface Area (m ² /g)	Carbon Load (%)	Endcapping
SL-II	-	-	3, 5	120	300	-	-
C18-MS-II	Octadecyl	Monomeric	2.5 ¹ , 3, 5	120	300	16	Yes
C18-AR-II	Octadecyl	Polymeric	3, 5, 15	120	300	17	Yes
C18-PAQ	Octadecyl	Polymeric	5	120	300	11	Yes
Protein-R	Octadecyl	Polymeric	5	300	150	Proprietary	Yes
PYE	2-(1-Pyrenyl)ethyl	-	5	120	300	18	Yes
NPE	Nitrophenylether	-	5	120	300	9	Yes
PBB	Pentabromobenzyl	-	5	120	300	8	Yes
HIC	Diol	-	5	300	150	7	Proprietary
Sugar-D	Proprietary	-	5	Proprietary	Proprietary	Proprietary	Proprietary
Cholester	Cholesteryl	Monomeric	2.5 ¹ , 5	120	300	20	Yes
HILIC	Triazole	-	2.5 ¹ , 5	120	300	Proprietary	-
πNAP	Naphthylethyl	Monomeric	2.5 ¹ , 5	120	300	11	Yes

¹ Pore size 130Å, surface area 330m²/g

COSMOSIL C18 Phases

The availability of a range of C18 phases allows the chromatographer to select the most appropriate phase for a specific application.

- 1) COSMOSIL C18-MS-II** is a monomerically bonded C18 phase. A new endcapping treatment with polar groups has extended the pH range of the material (2-10) and improved peak shape for basic compounds. This phase is recommended for the separation of low molecular weight organic compounds.
- 2) COSMOSIL C18-AR-II** is a polymerically bonded C18 phase exhibiting strong acid resistance (down to pH 1.5). It is particularly effective for the separation of chelating compounds as well as both acidic and basic compounds, including biopolymers. Compared with the monomeric COSMOSIL C18-MS-II, the polymeric C18-AR-II shows superior molecular shape selectivity.
- 3) COSMOSIL C18-PAQ** maintains stable retention time even in 100% aqueous eluents, due to partial coverage of the silica with C18 chains. A new mode of polymeric linkage gives the phase a strong acidic resistance and provides good separation for hydrophilic compounds.
- 4) COSMOSIL Protein-R** is a polymerically bonded wide pore phase, designed specifically for the separation of large peptides and proteins. High recovery is observed for a variety of proteins.

Figures 1 and 2 show the application of COSMOSIL 5C18-AR-II and 5C18-MS-II phases for the analysis of isoflavones and antipyretics respectively.

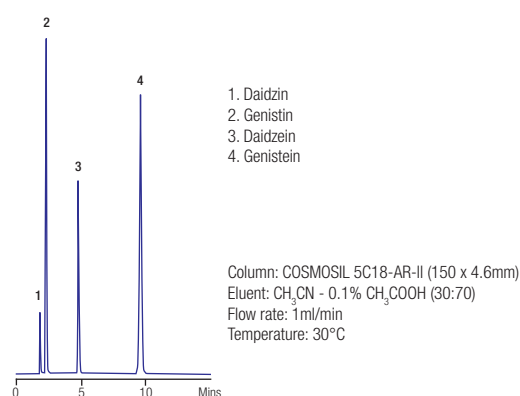


Figure 1. Separation of isoflavones on COSMOSIL 5C18-AR-II

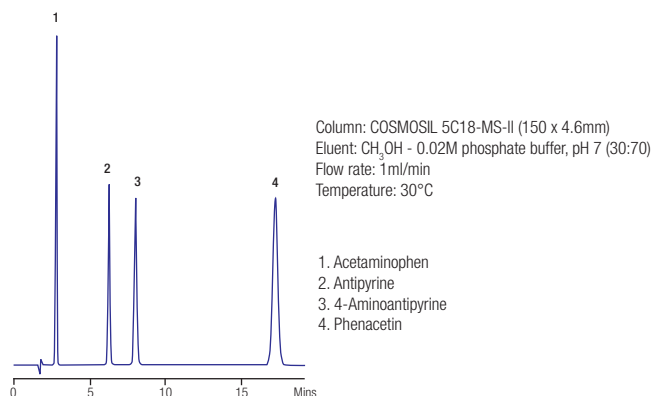


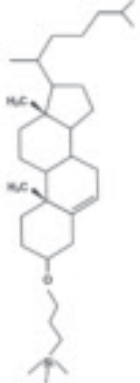
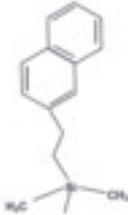
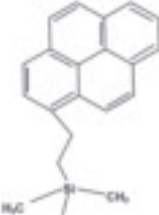


Figure 2. Separation of antipyretics on COSMOSIL 5C18-MS-II

Additional Bonded Phases

Alternative alkyl chain length columns, COSMOSIL C22-AR-II, 5C8-MS, 5C4-MS, and 5TMS-MS, and COSMOSIL 5NH2-MS, 5CN-MS and 5Diol columns are also available. Please contact Hichrom for further details.

Speciality Phases

Bonding and Main Interactions

Cholester	π NAP	PYE	NPE	PBB-R
				
Cholesteryl group	Naphthylethyl group	Pyrenylethyl group	Nitrophenylethyl group	Pentabromobenzyl group
Hydrophobic Interaction Molecular Shape Selectivity	Hydrophobic Interaction π - π Interaction	Hydrophobic Interaction π - π Interaction Charge-transfer Interaction Dispersion Force	Hydrophobic Interaction π - π Interaction Dipole-dipole Interaction	Hydrophobic Interaction Dispersion Force

COSMOSIL Cholester is a novel 3-[(cholesteryl)oxy]propylsilyl bonded silica phase. It shows the same hydrophobicity as C18 bonded phases, so can be used under similar reversed-phase conditions. However, a slightly different selectivity may be obtained. In particular, the rigid structure of the cholesterol imparts greater separation capabilities for isomeric, double-bonded and polyaromatic compounds. Figure 3 shows a comparison of stereoselectivity of Cholester and C18 phases for *o*-terphenyl and triphenylene.

COSMOSIL π NAP is a naphthylethyl bonded silica phase. The presence of two aromatic rings leads to stronger π - π interactions than with phenyl phases. COSMOSIL π NAP columns offer improved separation of positional isomers that are difficult to separate with alkyl bonded materials.

COSMOSIL PYE is a reversed-phase column with 2-(1-pyrenyl)ethyl groups bonded to the silica material. This column utilises π - π interactions originating from the planar pyrene ring structure to separate structural isomers (see Figure 4). Symmetrical isomers are retained more strongly. COSMOSIL PYE shows the strongest π - π interactions of all the speciality phases.

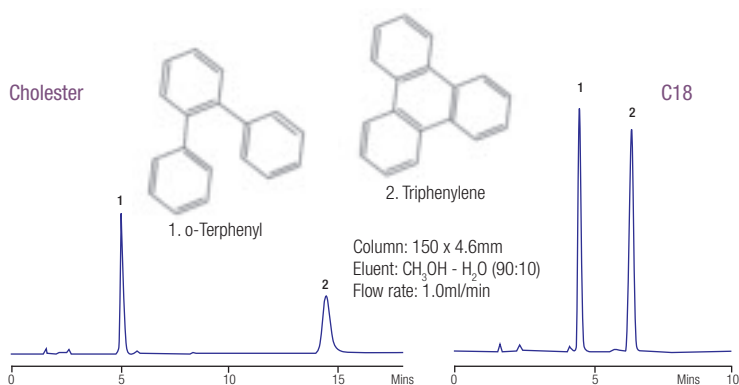


Figure 3. Comparison of stereoselectivity

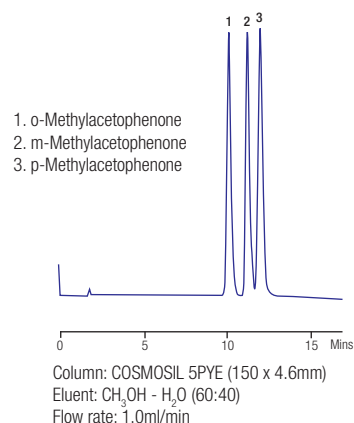


Figure 4. Separation of di-substituted benzenes

COSMOSIL NPE provides unique retention characteristics, utilising both dipole-dipole and π - π interactions. This is illustrated (Figure 5) by the separation of a mixture of polychlorodibenzo-p-dioxins (pCDDs). Isomers with a strong dipole moment exhibit greater retention.

COSMOSIL PBB-R provides unique selectivity for structurally similar compounds utilising dispersion force interactions, and can separate structural isomers which differ by only a double bond. Figure 6 shows the separation by dispersion force of Triton X-100 components on COSMOSIL PBB-R. Using a C18 column no separation was achieved, due to the poor hydrophobicity of the (-OCH₂CH₂-) group.

Speciality Phases (continued)

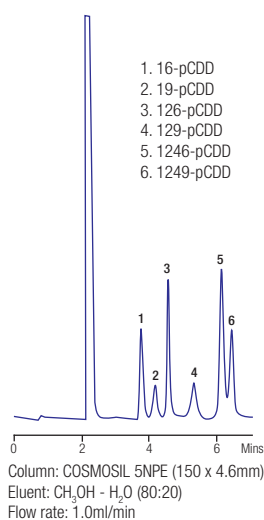


Figure 5. Polychlorodibenzo-p-dioxins (pCDDs)

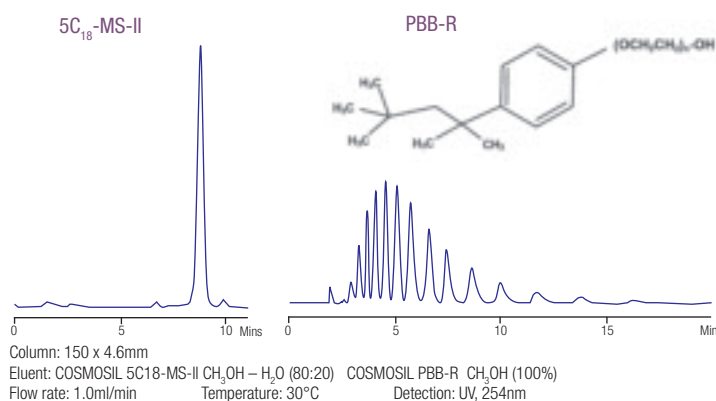


Figure 6. Analysis of Triton X-100 on COSMOSIL PBB-R

COSMOSIL HILIC

- Novel triazole bonded phase
- Strong retention for acidic compounds
- Enhanced sensitivity in LC-MS
- Good retention of polar compounds

COSMOSIL HILIC is a triazole bonded silica phase. It has a higher polarity than non-bonded silica commonly used for HILIC, resulting in stronger hydrophilic interactions. The positively charged triazole stationary phase also shows an anion-exchange mechanism, enabling acidic compounds to be strongly retained. The two separation modes – HILIC and ionic interaction – can be controlled by varying key eluent parameters such as pH, concentration of organic solvent and buffer ionic strength.

Figure 7 shows the advantage of using a triazole-bonded silica over non-bonded silica for the HILIC separation of trimethylene glycol and ethylene glycol.

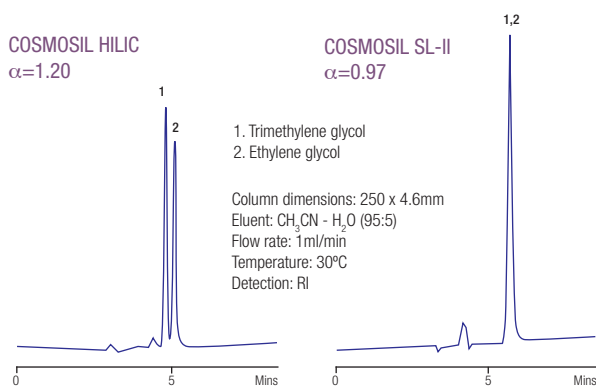


Figure 7. Hydrophilic interactions



COSMOSIL HILIC
Applications Guide
available on request

COSMOSIL Sugar-D

- Novel amino column for saccharides
- Improved column lifetime
- Useful for hydrophilic compounds

COSMOSIL Sugar-D is a novel phase designed for the analysis of saccharides. According to Nacalai Tesque it shows improved column durability compared to standard aminopropyl bonded phases, due to a new 'defence shield' bonding technology. This protection also minimises undesirable adsorption of certain saccharides. Figure 8 shows the separation of polyols on COSMOSIL Sugar-D. In addition, COSMOSIL Sugar-D is useful for separating highly hydrophilic compounds which are not retained on conventional C18 phases.

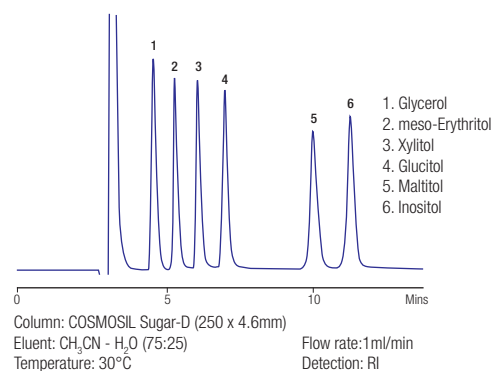


Figure 8. Analysis of polyols on COSMOSIL Sugar-D phase

Other Phases

COSMOSIL Wide Pore Phases

The COSMOSIL AR-300 series of packed columns are designed for the analysis of proteins and peptides and show good reproducibility and stability when used with TFA. Four phases are available: 5C18-AR-300, 5C8-AR-300, 5C4-AR-300 and 5Ph-AR-300.

COSMOSIL HIC

COSMOSIL 5HIC is a wide pore diol-bonded column for hydrophobic interaction chromatography. It is designed for the one-step desalting and separation of proteins, without denaturation. It has a higher loading capacity than ODS columns.

Special Columns for Fullerenes

The COSMOSIL range offers a variety of columns designed for the preparative scale separation of fullerenes and metallofullerenes. These include COSMOSIL Buckyprep and COSMOSIL PBB.

COSMOGEL IEX Series

The COSMOGEL IEX Series consists of anion-exchange, cation-exchange and amphoteric ion-exchange phase types (see table below). These are useful for the separation of biopolymers including proteins and nucleic acids.

Ion Exchange Mode	Anion-exchange Type		Cation-exchange Type		Amphoteric Ion-exchange Type	
	Type Q	Type Q-N	Type S	Type S-N	Type M	Type M-N
Packing Material	Hydrophilic Polymer / 5µm		Hydrophilic Polymer / 5µm		Hydrophilic Polymer / 5µm	
Gel / Average Particle Size	1000Å		1000Å		1000Å	
Average Pore Size	Non-porous		Non-porous		Non-porous	
Functional Group	-CH ₃ N ⁺ (CH ₃) ₃		-(CH ₂) ₃ SO ₃ ⁻		-CH ₃ N ⁺ (CH ₃) ₃ + -(CH ₂) ₃ SO ₃ ⁻	
Target Sample	Acidic proteins and DNA		Basic proteins		All proteins	

COSMOSIL SFC Columns

Two bonded phases have been developed to enhance the capability of SFC separations - COSMOSIL 3-Hydroxyphenyl and COSMOSIL Quinoline. Please contact Hichrom for further information.



Ordering Information

5µm COSMOSIL Phase	Column Dimensions ¹ (mm)						Guard Column (10 x 4.6mm, 1/pk)
	150 x 2.0	250 x 2.0	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	
SL-II	-	-	37999-81	38000-01	38001-91	38002-81	37997-01
C18-AR-II	37992-51	05272-71	38142-51	38143-41	38144-31	38145-21	38141-61 ²
C18-MS-II	38025-91	05761-61	38017-01	38018-91	38019-81	38020-41	38014-31 ²
C18-PAQ	34449-71	05795-31	34451-21 ³	05799-91	02486-71	02485-81	02484-91
Protein-R	06514-71	-	06525-31	-	06526-21	06527-11	06518-31
PYE	38042-61	34450-31	38043-51	-	37837-91	37989-11	37903-11
NPE	34328-51	34379-91	-	-	37902-21	37990-71	37904-01
PBB-R	05900-31	-	-	-	05697-21	05698-11	05704-11
HIC	-	-	04263-21	-	-	-	-
Sugar-D	05688-41	05689-31	-	-	05395-71	05397-51	05394-81
Cholester	05971-11	05972-01	-	06591-61	05976-61	05977-51	05975-71
HILIC	07054-71	-	-	-	07056-51	07057-41	07055-61
πNAP	08078-41	08079-31	08083-61	08084-51	08085-41	08086-31	08082-71

¹ Other dimensions available, including preparative columns

² Guard cartridges (3/pk) also available – please enquire

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Please contact Hichrom for further details and ordering information on COSMOSIL and COSMOGEL phases not listed above.