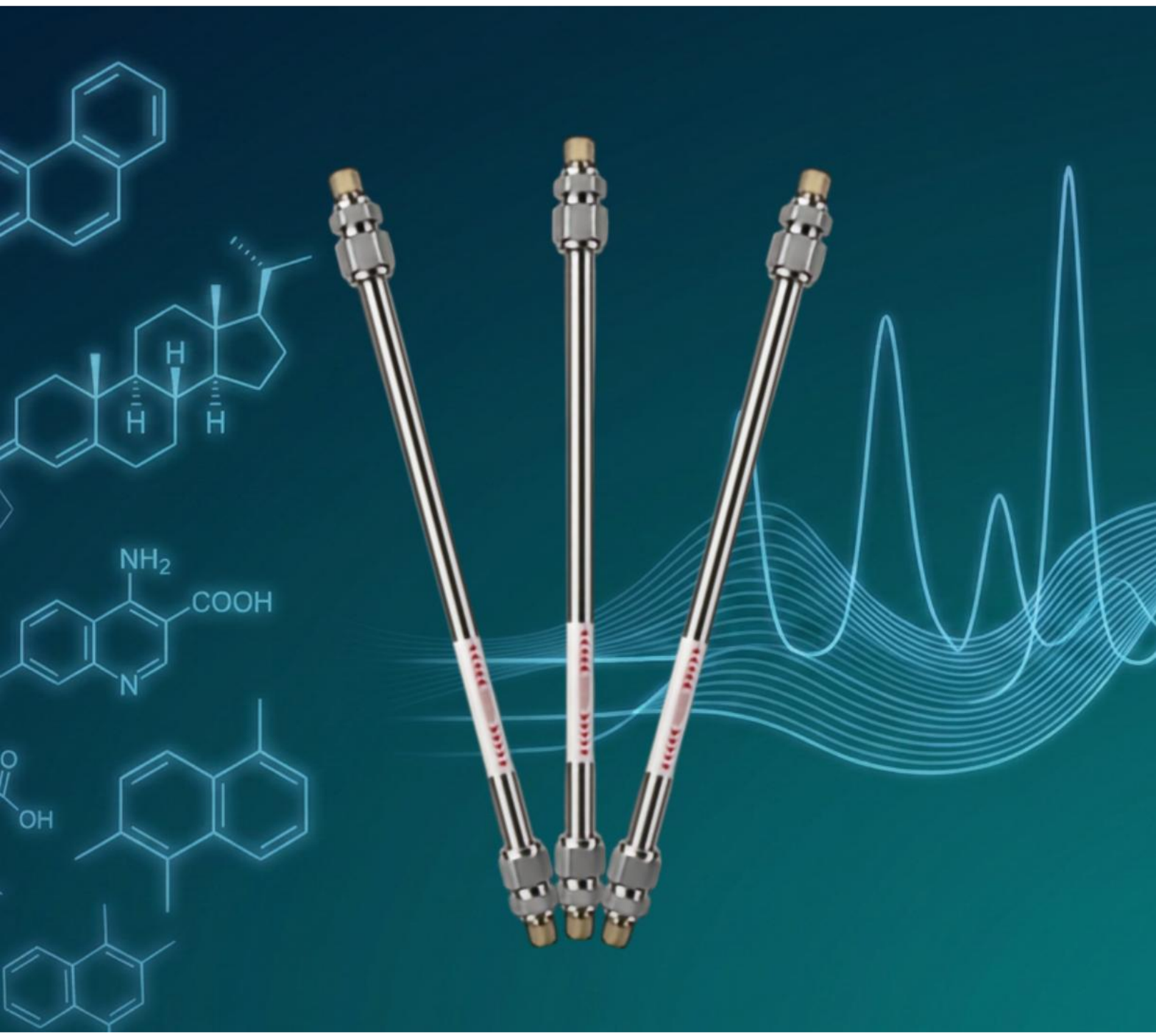
FUJIFILM
Value from Innovation

Wako

Column for HPLC
Wakopak Series



FUJIFILM Wako Pure Chemical Corporation

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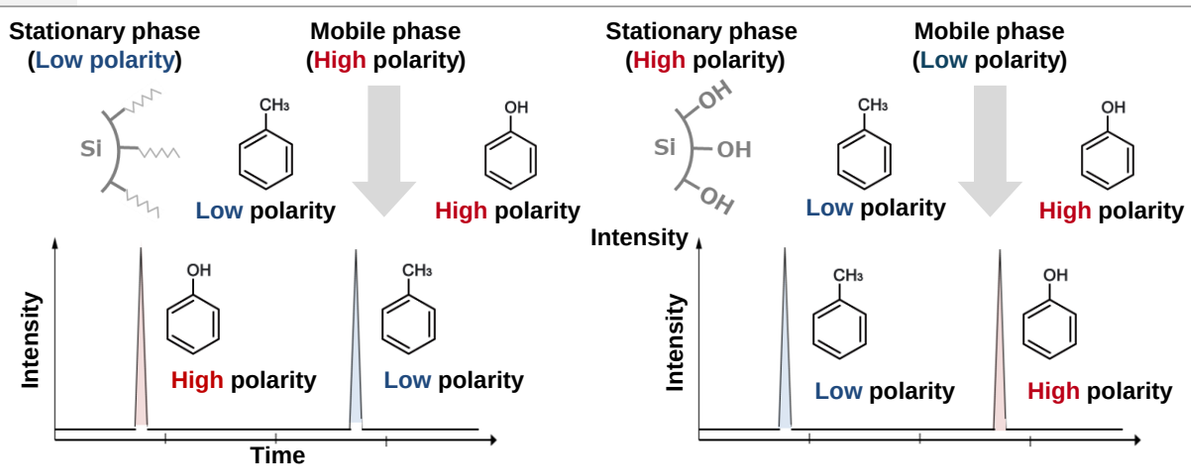
Wakopak Selection Guide

We offer a full line of columns specifically designed for high-performance liquid chromatography (HPLC) (Wakopak Series).In HPLC, the combination of the column and the mobile phase (selection of the separation mode) is critical for the separation of target substances. Various factors influence mobile phase selection, such as the type of solvent, its composition ratio, and pH, and it is necessary to select a column with stationary phase (packing material) that is compatible with these conditions. Furthermore, the length, inner diameter, and particle size of the selected column are also important factor. In this section, we will introduce the characteristics of each packing material and the corresponding Wakopak series.

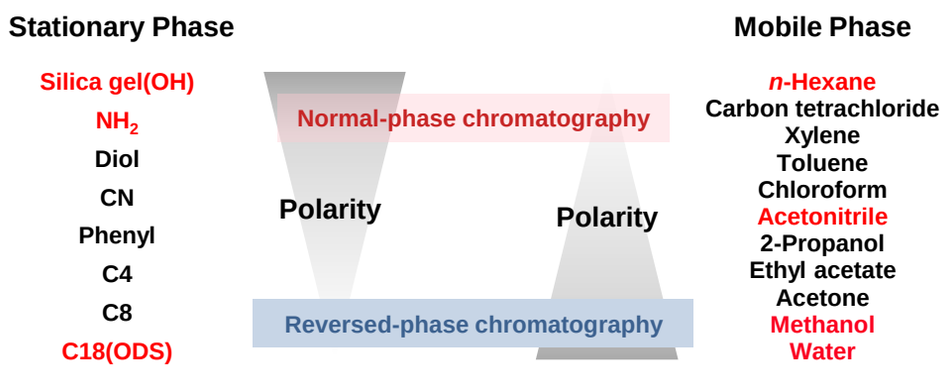
Selection of Separation Mode (Normal-phase and Reversed-phase)

In chromatography, the method that uses a low-polarity stationary phase and a high-polarity mobile phase is called reversed-phase chromatography; conversely, the method in which the stationary phase has higher polarity than the mobile phase is called normal-phase chromatography. Reversed-phase chromatography is the most commonly used separation mode in HPLC and can be applied to a wide range of compounds. On the other hand, normal-phase chromatography uses nonpolar organic solvents as the mobile phase, so it is used to separate compounds that are difficult to separate in Reversed-Phase mode or compounds that are prone to hydrolysis.

	Reversed-phase Chromatography	Normal-phase Chromatography
Features	A type of chromatography that separates hydrophobic target compounds using a polar solvent as the mobile phase. It is the most commonly used method in HPLC and enables the separation of a wide variety of compounds.	A type of chromatography that separates hydrophilic target compounds using a nonpolar solvent as the mobile phase. A chromatographic method that separates hydrophilic target compounds using a nonpolar solvent as the mobile phase.
Stationary Phase	Hydrophobic (alkyl-chain-modified)	Hydrophilic (unmodified)
Polarity of the Mobile Phase	**High** → **Low**	**Low** → **High**
Elution Order	**Highly** polar components → **Lowly** polar components	**Less** polar components → **More polar** components



Each Stationary Phase (Packing Material) and Its corresponding Mobile Phase

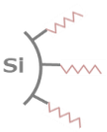


Selection of Packing Material Properties

The separation efficiency of HPLC varies significantly depending on the characteristics of the packing material, such as modification, alkyl chain length, end-cap, and structure (monomeric/polymeric). By selecting a packing material suited to the polarity and structure of the target compounds, it is possible to optimize retention behavior and analysis time.

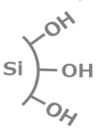
Type of Packing Material

In reversed-phase chromatography, stationary phases consisting of silica gel chemically bonded with alkyl chains are commonly used. Typical examples include C1, C4, C8, and C18 (ODS) phases. Among these, octadecyl-bonded silica (C18, ODS) is the most widely used stationary phase. In normal-phase chromatography, either unmodified silica gel (SIL) or silica gel bonded with polar functional groups, such as aminopropyl (NH_2), is commonly used. In addition, we offer columns with stationary phases modified with phenyl groups (Ph) or fluorinated silicone (F), among others. These stationary phases may exhibit unique selectivity toward specific classes of compounds, such as aromatic and fluorinated compounds.



Silica gel (Alkyl-chain-modified)

- Silica gel bonded with alkyl chains such as octyl (C8), octadecyl (C18, ODS), and docosyl (C22).
- Used in **reversed-phase chromatography**.



Silica gel (unmodified)

- **Chemically unmodified** silica gel (with exposed hydroxyl groups).
- Used in **normal-phase chromatography**.

Silica gel (Other)

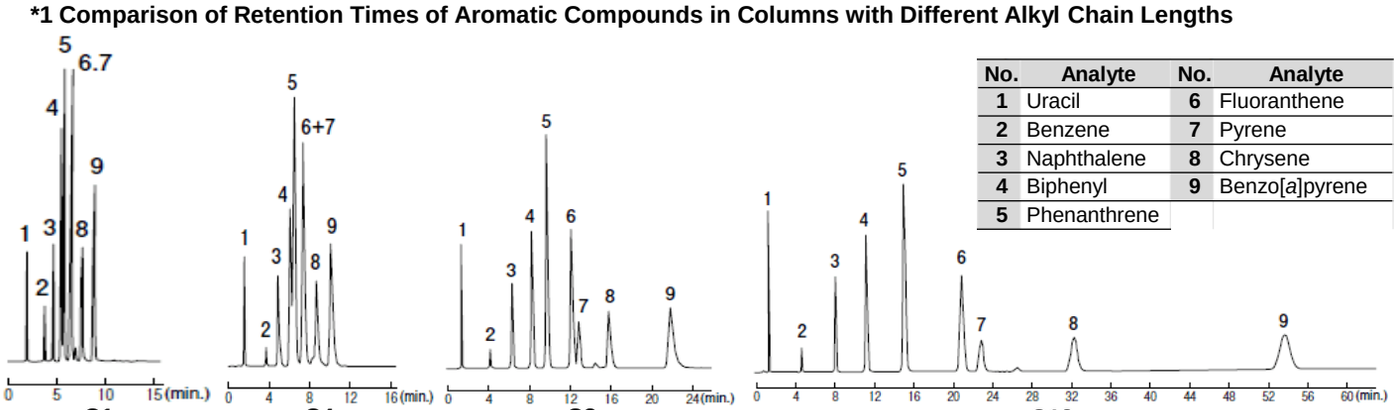
- Silica gel bonded with phenyl (Ph), aminopropyl (NH_2), and other functional groups.
- Exhibits unique selectivity based on the characteristics of the bonded functional groups.

Relationship Between Alkyl Chain Length and Separation Behavior in Alkyl-Modified Silica Gel

The relationship between alkyl chain length and chromatographic behavior in HPLC is shown below. Compared with conventional ODS columns, shorter-chain stationary phases may be more suitable when highly retained compounds must be eluted more rapidly or when increasing the organic solvent content of the mobile phase is impractical. Conversely, longer-chain stationary phases provide stronger retention of low-polarity compounds and may also exhibit unique structural recognition ability not observed with conventional ODS columns.

	C1 (TMS)	C4	C8	C18 (ODS)	C22	C30
Carbon Content (C%)	Low	→				High
Polarity of the Retained Compounds	High	←				Low
Retention of Low-polarity Compounds*1	Weak	→				Strong
Analysis time for Low-polarity Compounds*1	Short	→				Long
Structural Recognition Ability*2	Low	→				High

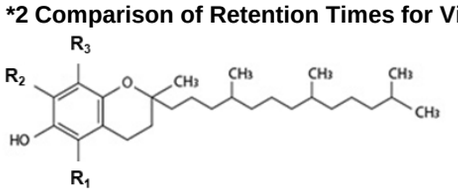
***1 Comparison of Retention Times of Aromatic Compounds in Columns with Different Alkyl Chain Lengths**



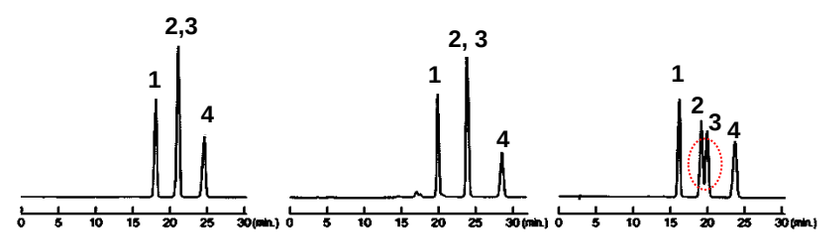
No.	Analyte	No.	Analyte
1	Uracil	6	Fluoranthene
2	Benzene	7	Pyrene
3	Naphthalene	8	Chrysene
4	Biphenyl	9	Benzo[*a*]pyrene
5	Phenanthrene		

C1 (Wakosil® 5TMS) **C4 (Wakosil® 5C4)** **C8 (Wakosil® 5C8)** **C18 (Wakosil® 5C18)**

***2 Comparison of Retention Times for Vitamin E Homologues on Columns with Different Carbon Chain Lengths**



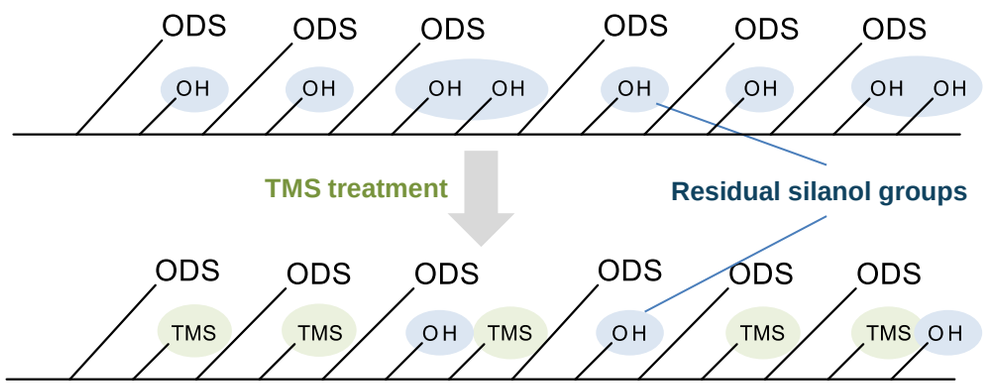
	R_1	R_2	R_3
1) δ-Tocopherol	H	H	CH_3
2) γ-Tocopherol	H	CH_3	CH_3
3) β-Tocopherol	CH_3	H	CH_3
4) α-Tocopherol	CH_3	CH_3	CH_3



C18 (Navi C18-5) **C22 (Navi C22-5)** **C30 (Navi C30-5)**

Endcapping

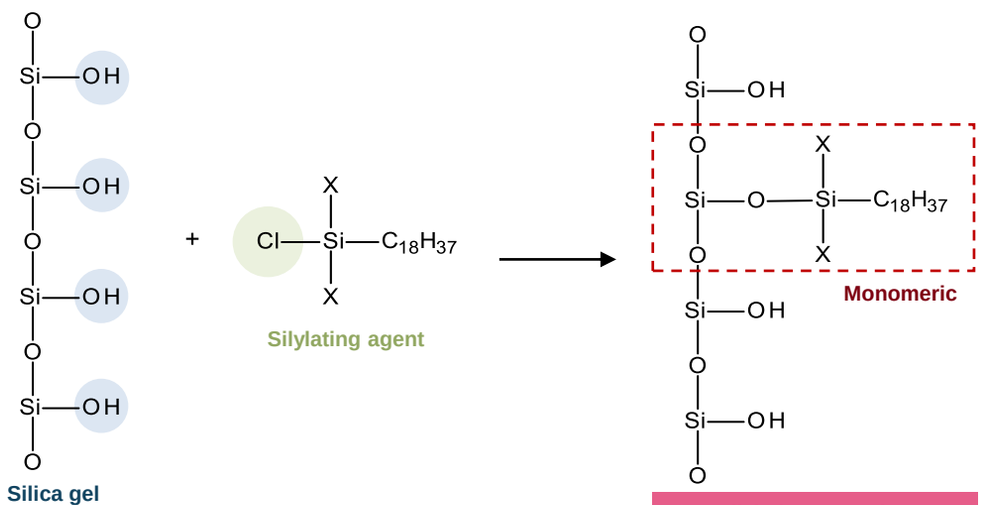
Silica gel is modified by reacting surface silanol groups with a silylating agent. However, some silanol groups may remain unreacted after the modification process. These residual silanol groups can interact with basic compounds and cause peak tailing. end-cap is a secondary silylation process used to deactivate residual silanol groups, typically using reagents such as trimethylmonochlorosilane (TMCS).



Monomeric and Polymeric

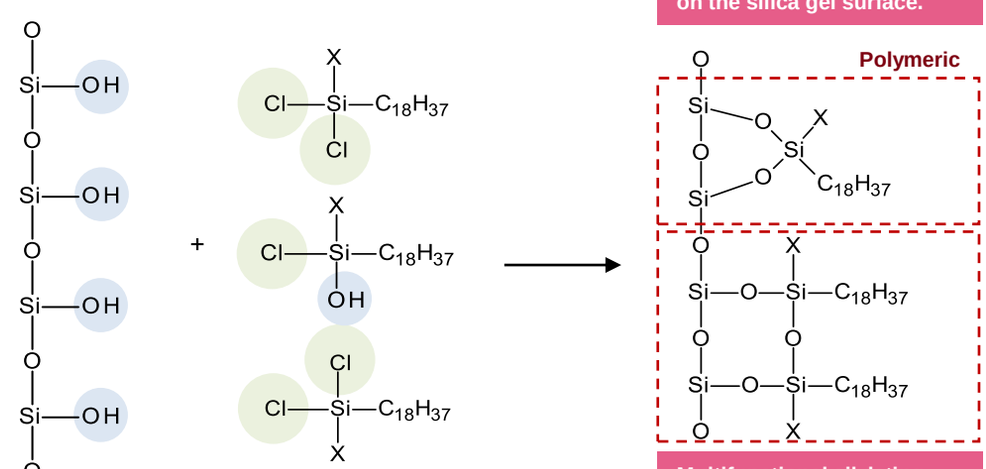
Monomeric refers to a structure in which a silylating agent is bonded to a surface silanol group in a 1:1 ratio. Polymeric refers to a structure formed through the reaction of polyfunctional silylating agents, resulting in a high-density and densely packed octadecyl layer. Polymeric-type packing generally exhibits superior durability and is less susceptible to hydrolysis under aqueous mobile-phase conditions. In addition, polymeric-type packing may provide unique shape selectivity compared with monomeric-type packing and is often used for the separation of peptides and structural isomers.

Monomeric



One silylating agent is bonded to one silanol group on the silica gel surface.

Polymeric



Multifunctional silylating agents polymerize, or a single silylating agent bonds to multiple silanol groups, forming a high-density octadecyl layer.

Selection of Elution Solvents

When performing HPLC analysis, the selection of the solvent to be used as the mobile phase is extremely important. Key factors in solvent selection include the solvent's properties (viscosity, UV wavelength, etc.), solubility (it should dissolve the sample adequately without reacting with it), and miscibility (it should be miscible with other solvents).

Solvent Properties

Refractive Index (n^{D}_{20})

When using a differential refractive index detector to detect a target compound, the greater the difference in refractive index between the solvent and the target compound, the higher the detection sensitivity.

Boiling Point (°C)

As the column temperature approaches the boiling point of mobile phase, bubbles are more likely to form; therefore, it is necessary to maintain a sufficient temperature difference between the column temperature and the boiling point of the mobile phase.

Viscosity (η *at* 20°C)

As the viscosity of the mobile phase decreases, the diffusion coefficient increases and mass transfer becomes more efficient, resulting in improved column efficiency (separation efficiency). Using a highly viscous mobile phase results in greater pressure loss and longer analysis times; therefore, a mobile phase with the lowest practical viscosity should be used.

Dielectric Constant (ε_r)

It is used as a measure of polarity. To select an mobile phase suitable for the dissolution and separation of the target compound, it is necessary to consider the polarity of the solvent.

UV Cut-off Wavelength (nm)

When using a UV absorption detector, the absorption of the solvent itself can interfere with the detection of the target compound. For this reason, the UV cut-off wavelength of the solvent serves as a guideline for selection.
Since our HPLC and LC/MS solvents have specified values for each absorption wavelength, these wavelengths should be used as a reference.

Solvent	Molecular Weight	Specific Gravity	Refractive Index (n^{D}_{20})	Boiling Point (°C)	Viscosity (η *at* 20°C/mPa·s)	Dielectric constant (ε_r)
Acetone	58.08	0.790-0.793	1.358-1.360	56.3	0.32	21
Acetonitrile	41.05	0.782-0.784	1.344-1.346	81.8	0.37	38
Benzene	78.11	0.877-0.881	1.499-1.502	80.1	0.65	2.3
Carbon Tetrachloride	153.82	1.594-1.599	1.459-1.461	76.7	0.55	2.2
Chloroform	119.38	1.477-1.494	1.444-1.446	61.2	0.57	5.1
1-Chloronaphthalene	162.62	1.194	1.633	259.3	2.940 mPa·s	-
Cyclohexane	84.16	0.777-0.781	1.425-1.427	80.7	1.0	2.0
***o*-Dichlorobenzene**	147.00	1.305-1.315	1.551-1.552	180.5	-	-
1,2-Dichloroethane	98.96	1.259-1.267	1.445	83.5	0.840 mPa·s	-
Dichloromethane	84.93	1.325-1.333	1.424-1.426	40.2	0.44	7.8
***N*,*N*-Dimethylformamide**	73.10	0.949-0.954	1.428-1.432	153 (760 mmHg) 76 (39 mmHg) 25 (3.7 mmHg)	-	-
1,4-Dioxane	88.11	1.033-1.038	1.421-1.423	101.4	1.54	2.1
Water	18.02	1.000	1.332-1.334	100	1.00	80
Ethyl Acetate	88.11	0.899-0.904	1.372-1.374	76.8	0.45	6.1
Ethanol	46.07	0.790-0.793	1.360-1.363	78.3	1.20	25
***n*-Heptane**	100.20	0.683-0.685	1.387-1.389	100.2	0.41	1.9
***n*-Hexane**	86.18	0.660	1.374-1.376	68.7	0.3	1.9
2-Propanol	60.10	0.785-0.788	1.376-1.378	82.4	2.3	20
Methanol	32.04	0.791-0.794	1.327-1.330	64.7	0.60	33
1-Propanol	60.10	0.802-0.807	1.385-1.387	97.2	-	-
Tetrahydrofuran	72.11	0.887-0.891	1.407-1.409	66	0.55	7.6
Toluene	92.14	0.866-0.869	1.496-1.498	110.6	0.59	2.4
1,2,4-Trichlorobenzene	181.45	1.460-1.470	1.570-1.572	213	-	-
2,2,4-Trimethylpentane	114.23	0.690-0.693	1.390-1.393	99.2	0.50	-

Solvent Solubility

Solubility Parameter (δ)

A solubility parameter derived from the boiling point that reflects solvent polarity and strength. High δ values indicate good solubility for polar compounds, whereas low δ values favor the dissolution of low-polarity compounds.

Dispersion Solubility Parameter (δ_D)

Indicates the degree to which a solvent selectively dissolves aromatic compounds containing -S-, -Cl, or -I groups (such as naphthalene, DDT, and hexachlorobenzene). The higher the δ_D , the better the solvent dissolves the sample.

Orientation (Polarity) Solubility Parameter (δ_O)

Indicates the ability of a solvent to interact with and dissolve polar compounds having high dipole moments, such as nitro compounds, nitriles, and ketones.

Proton Acceptor Solubility Parameter (δ_A)

Indicates the extent to which acidic compounds (such as alcohols, phenols, and carboxylic acids) are selectively dissolved.

Solubility Parameter of Proton Donors (δ_H)

Indicates the degree to which a solvent selectively dissolves basic compounds (amines, ethers, sulfur compounds, etc.).

Solvent Strength (ε°)

Solvent strength in adsorption chromatography using alumina.

Viscosity (η at 20°C)

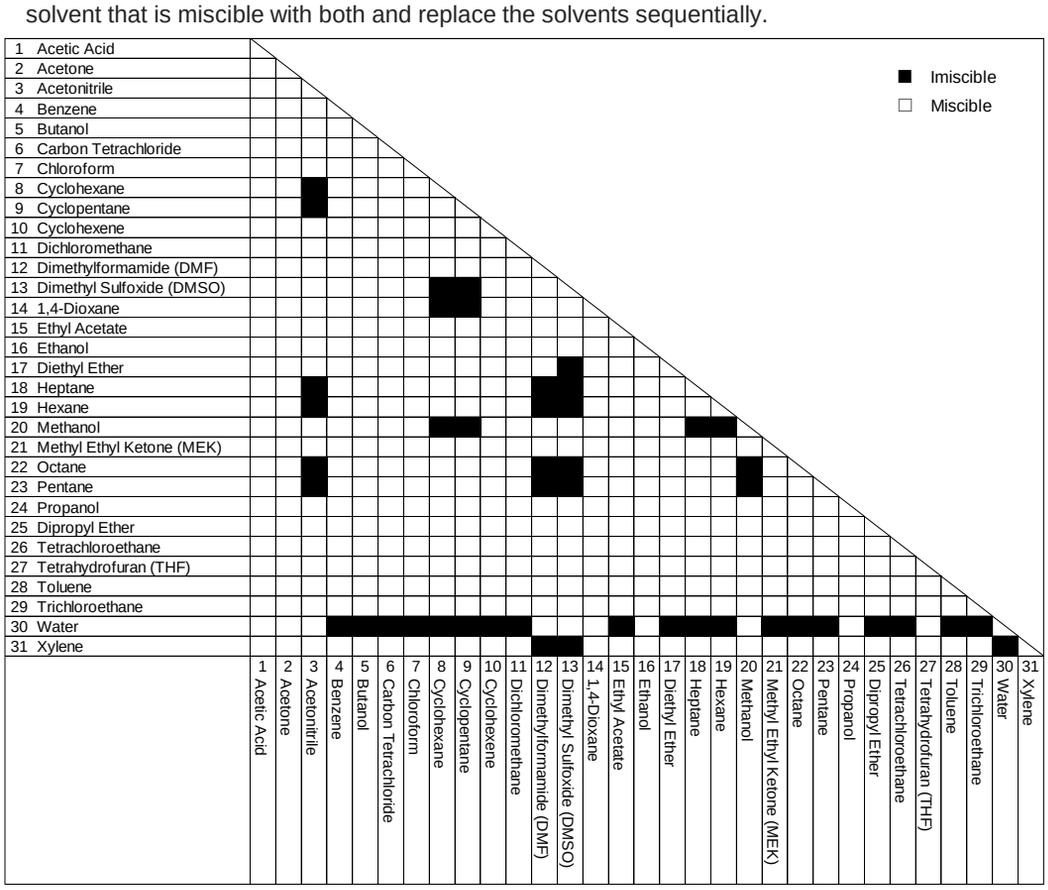
As the viscosity of the mobile phase decreases, the diffusion coefficient increases and mass-transfer efficiency improves, resulting in higher column efficiency. In contrast, highly viscous mobile phases generate greater backpressure and longer analysis times. Therefore, a mobile phase with the lowest practical viscosity is generally preferred.

Solvent	δ	δ_D	δ_O	δ_A	δ_H	ε°	η
2,2,4-Trimethylpentane	7.0	7.0	0	0	0	0.01	0.50
***n*-Hexane**	7.3	7.3	0	0	0	0.01	0.32
***n*-Heptane**	7.4	7.4	0	0	0	0.01	0.41
Cyclohexane	8.2	8.2	0	0	0	0.04	1.00
Carbon Tetrachloride	8.6	8.6	0	0.5	0	0.18	0.97
Ethyl Acetate	8.6	7.0	3.2	2	2	0.58	0.45
Toluene	8.9	8.9	0	0	0.5	0.29	0.59
Chloroform	9.1	8.1	3	0.5	0	0.40	0.57
Tetrahydrofuran	9.1	7.6	4	3	0	0.45	-
Benzene	9.2	9.2	0	0	0	0.32	0.65

Solvent	δ	δ_D	δ_O	δ_A	δ_H	ε°	η
Dichloromethane	9.6	6.4	5.5	0.5	0	0.42	0.44
Chlorobenzene	9.6	9.2	2	0	0	0.30	0.79
1,2-Dichloroethane	9.7	8.2	4	1	0	0.44	0.79
1,4-Dioxane	9.8	7.8	4	3	0	0.56	1.54
1-Propanol	10.2	7.2	2.5	4	4	0.82	2.3
Ethanol	11.2	6.8	4.0	5	5	0.88	1.20
***N*,*N*-Dimethylformamide**	11.5	7.9	-	-	-	-	-
Acetonitrile	11.8	6.5	8	2.5	0	0.65	0.37
Methanol	12.9	6.2	7.5	7.5	7.5	0.95	0.60
Water	21	6.3	Large	Large	Large	-	-

Solvent Miscibility[1)]

If solvents that are immiscible with one another are introduced into the HPLC system, column, or mobile phase, they may cause column damage, reduced reproducibility, or system malfunctions. If two mobile phases are immiscible, use an intermediate solvent that is miscible with both and replace the solvents sequentially.



1) the Kanto Branch of the Japan Society for Analytical Chemistry: *Handbook of High-Performance Liquid Chromatography*, MARUZEN, (1985).

Selection of packing materials

Mode	Functional Group	Packing Material Name		USP L No.	Particle Size (μm)	Pore Size (nm)	Specific Surface Area (m^2/g)	Pore Volume (mL/g)	C%
Reversed Phase	C1 (TMS)	Wakosil® 5TMS	➡P. 30	L13	5	12	300	1.0	4
	C4	Wakosil® 5C4	➡P. 32	L26	5	12	300	1.0	8
		Wakosil® 5C4-200	➡P. 32	L26	5	20	200	1.0	5
	C8	Wakosil®-II 3C8-100 HG	➡P. 33	L7	3	10	350	1.0	10
		Wakosil®-II 3C8 RS	➡P. 34	L7	3	10	400	1.0	10
		Wakosil® 5C8	➡P. 32	L7	5	12	300	1.0	12
		Wakosil®-II 5C8 HG	➡P. 33	L7	5	12	300	1.0	10
		Wakosil®-II 5C8 RS	➡P. 34	L7	5	12	400	1.0	10
	C18 (ODS)	Ultra C18-2	➡P. 12	L1	2	10	340	0.9	16
		Ultra C18-3	➡P. 12	L1	3	13	340	1.1	16
		Wakosil®-II 3C18 AR	➡P. 17	L1	3	12	300	1.0	20
		Wakosil®-II 3C18 HG	➡P. 15	L1	3	12	300	1.0	15
		Wakosil®-II 3C18 RS	➡P. 16	L1	3	11	410	1.0	17
		Navi C18-5	➡P. 28	L1	5	12	300	1.0	19
		Ultra C18-5	➡P. 12	L1	5	13	340	1.1	16
		Wakosil® 5C18	➡P. 22	L1	5	12	300	1.0	20
		Wakosil® 5C18-200	➡P. 22	L1	5	20	200	1.0	12
		Wakosil® 5C18-200N	➡P. 24	L1	5	20	200	1.0	12
		Wakosil® 5C18-200T	➡P. 23	L1	5	20	200	1.0	12
		Wakosil® 5C18 AR	➡P. 22	L1	5	12	300	1.0	17
		Wakosil® 5C18N	➡P. 23	L1	5	12	300	1.0	20
		Wakosil® 5C18T	➡P. 22	L1	5	12	300	1.0	20
		Wakosil®-II 5C18-100	➡P. 15	L1	5	10	350	1.0	22
		Wakosil®-II 5C18 AR	➡P. 17	L1	5	12	300	1.0	20
		Wakosil®-II 5C18 AR Prep	➡P. 20	L1	5	12	300	1.0	18
		Wakosil®-II 5C18 HG	➡P. 15	L1	5	12	300	1.0	15
		Wakosil®-II 5C18 HG Prep	➡P. 19	L1	5	12	300	1.0	16
		Wakosil®-II 5C18 RS	➡P. 16	L1	5	12	410	1.2	17
		Wakosil®-II 5C18 RS Prep	➡P. 20	L1	5	12	400	1.2	17
		eco-ODS	➡P. 26	L1	5	12	300	1.0	16
		Handy ODS	➡P. 25	L1	5	12	300	1.0	16
		Wakosil® 7C18	➡P. 22	L1	7	12	300	1.0	20
		Wakosil® 10C18	➡P. 22	L1	10	12	300	1.0	20
		Wakosil® 10C18-200	➡P. 22	L1	10	20	200	1.0	12
	C22	Navi C22-5	➡P. 28	-	5	12	400	1.2	20
		Wakosil®-II 5C22	➡P. 29	-	5	12	330	1.0	20
	C30	Navi C30-5	➡P. 29	L62	5	12	300	1.0	23
	Ph (Phenyl)	Wakosil® 5Ph	➡P. 36	L11	5	12	300	1.0	9
	Fluorinated silicone	Fluofix®-II 120E	➡P. 37	L##	5	12	300	1.0	10
Normal Phase	CN (Cyanopropyl)	Wakosil® 5CN	➡P. 43	L10	5	12	300	1.0	7
		Wakosil®-II 5CN	➡P. 43	L10	5	11	360	1.0	7
	NH_2 (Aminopropyl)	Wakosil® 5NH_2	➡P. 44	L8	5	12	300	1.0	-
	OH (SIL)	Wakosil® 5SIL	➡P. 40	L3	5	6	500	0.8	-
		Wakosil® 5SIL-120	➡P. 40	L3	5	12	300	1.0	-
		Wakosil®-II 5SIL Prep	➡P. 41	L3	5	12	300	1.0	-
		Wakosil® 7SIL-120	➡P. 40	L3	7	12	300	1.0	-
		Wakosil® 10SIL	➡P. 40	L3	10	6	500	0.8	-
HILIC	OH (SIL)	Wakosil®-II 5SIL-AQ	➡P. 42	L3	5	6	500	0.8	-
Size Exclusion	$(OH)_2$ (Diol)	Wakosil® 5Diol-60	➡P. 45	L20,L33,L59	5	6	-	-	-
		Wakosil® 5Diol-120	➡P. 45	L20,L33,L59	5	12	-	-	-
		Wakosil® 5Diol-200	➡P. 45	L20,L33,L59	5	20	-	-	-
		Wakosil® 5Diol-300	➡P. 45	L20,L33, L59	5	30	-	-	-
Specialty Columns	C18 (ODS)	Combi ODS	➡P. 46	L1	5	10	400	1.2	17
		Combi ODS fast	➡P. 46	L1	3	10	400	1.0	17
	CN (Cyanopropyl)	Combi CN	➡P. 46	L10	5	10	400	1.0	9
	For ADRA Analysis	Core C18 ADRA	➡P. 56	-	-	-	-	-	-
	For Amino Acid Analysis	Ultra APDS TAG®	➡P. 52	-	-	-	-	-	-
	For Pesticide Residue Analysis	Wakosil® Agri-9	➡P. 49	-	5	-	-	-	-
	For Oxine Copper Analysis	Wakosil®-Cu	➡P. 49	L1	5	-	-	-	-
	For Anionic Surfactants (LAS) Analysis	Wakosil® AS-Aqua	➡P. 48	-	5	-	-	-	-
	For DNPH Aldehyde Analysis	Wakosil® DNPH	➡P. 50	-	5	-	-	-	-
		Wakosil® DNPH-II	➡P. 50	-	5	-	-	-	-
	For Oligo DNA Analysis	Wakosil®-DNA	➡P. 54	-	5	-	-	-	-
	For Biological Sample Analysis	Wakosil® GP-N6	➡P. 55	-	5	-	-	-	-
	For PAH Analysis	Wakosil®-PAHs	➡P. 47	L1, L118	5	-	-	-	-
	For Sugar/Sugar Alcohol Analysis	Wakobeads-T	➡P. 54	-	-	-	-	-	-

* No practical tests have been conducted using the values listed here.

Bonding Type	End-capping	Max Press. (MPa)*	pH Range*	Packing Solvent	Other Features
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	-
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	-
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Enables rapid analysis
Monomeric	✓	30	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high number of theoretical plates/retention capacity
Monomeric	✓	30	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high resolution in aqueous mobile phases
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	-
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high number of theoretical plates
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high resolution in aqueous mobile phases
Polymeric	✓	70	1.5-10.0	CH_3CN/H_2O=70/30	Low adsorption (polar compounds), usable at pH 1.5–10.0, for UHPLC
Polymeric	✓	30	1.5-10.0	CH_3CN/H_2O=70/30	Low adsorption (polar compounds), usable at pH 1.5–10.0
Polymeric	✓	30	1.4-9.4	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, usable at pH 1.4–9.4, high stereoselectivity
Monomeric	✓	30	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high number of theoretical plates
Monomeric	✓	30	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high resolution in aqueous mobile phases
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Enables comparison of C18-C30 packing materials
Polymeric	✓	20	1.5-10.0	CH_3CN/H_2O=60/40	Low adsorption (polar compounds), usable at pH 1.5–10.0
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	-
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Enables rapid analysis
Monomeric	-	20	2.0-7.5	CH_3CN/H_2O=60/40	Adsorption due to silanol groups, enables rapid analysis
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Reversed-phase distribution and adsorption due to trace silanol groups, enables rapid analysis
Polymeric	✓	20	1.4-9.4	CH_3CN/H_2O=60/40	Usable at pH 1.4–9.4, high stereoselectivity
Monomeric	-	20	2.0-7.5	CH_3CN/H_2O=60/40	Adsorption due to silanol groups
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Reversed-phase distribution and adsorption due to trace silanol groups
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high retention capacity
Polymeric	✓	20	1.4-9.4	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, usable at pH 1.4–9.4, high stereoselectivity
Polymeric	✓	20	1.4-9.4	CH_3CN/H_2O=60/40	Preparative column, usable at pH 1.4–9.4, high stereoselectivity
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high number of theoretical plates
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Preparative column, high number of theoretical plates
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel, high resolution in aqueous mobile phases
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Preparative column, high resolution in aqueous mobile phases
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Low price, uses environmentally friendly packaging materials
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Low price
Monomeric	✓	15	2.0-7.5	CH_3CN/H_2O=60/40	-
Monomeric	✓	10	2.0-7.5	CH_3CN/H_2O=60/40	-
Monomeric	✓	15	2.0-7.5	CH_3CN/H_2O=60/40	Enables rapid analysis
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Enables comparison of C18-C30 packing materials, high stereoselectivity
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	High-purity and low metal silica gel
Polymeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	Enables comparison of C18-C30 packing materials, high stereoselectivity
Monomeric	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	-
-	✓	20	2.0-7.5	CH_3CN	Specifically retains halogen-containing compounds
Monomeric	-	20	2.0-7.5	Ethanol	-
Monomeric	✓	20	2.0-7.5	Ethanol	High-purity and low metal silica gel
Monomeric	-	20	2.0-7.5	Ethanol	-
-	-	20	1.5-7.5	*n*-Hexane/CH_3CN=99/1	-
-	-	20	1.5-7.5	*n*-Hexane/CH_3CN=99/1	Enables rapid analysis
-	-	15	1.5-7.5	*n*-Hexane/CH_3CN=99/1	Preparative column
-	-	15	1.5-7.5	*n*-Hexane/CH_3CN=99/1	Enables rapid analysis
-	-	10	1.5-7.5	*n*-Hexane/CH_3CN=99/1	-
-	-	20	1.5-7.5	CH_3CN	Used in the Hydrophilic Interaction Chromatography (HILIC) separation mode
-	-	35	5.0-7.5	0.05% NaN_3	Silica-based gel filtration column
-	-	35	5.0-7.5	0.05% NaN_3	Silica-based gel filtration column
-	-	35	5.0-7.5	0.05% NaN_3	Silica-based gel filtration column
-	-	35	5.0-7.5	0.05% NaN_3	Silica-based gel filtration column
-	✓	20	2.0-7.5	CH_3CN/H_2O=60/40	For combinatorial chemistry purification
-	✓	30	2.0-7.5	CH_3CN/H_2O=60/40	For combinatorial chemistry purification, enables rapid analysis
-	-	20	2.0-7.5	Ethanol	For combinatorial chemistry purification
-	-	60	-	-	For ADRA analysis, compliant with Test Guideline No. 442C
-	-	-	-	-	For LC/MS amino acid analysis using the APDS method, for UHPLC
-	-	20	2.0-7.5	Wakosil® Agri-9 Mobile phase	For pesticide residue analysis
-	-	20	2.0-7.5	Wakosil® Agri-9 Mobile phase	ODS Column for oxine copper (pesticide) analysis
-	-	20	2.0-7.5	CH_3CN/H_2O=60/40	LAS homologs are separated into distinct peaks according to alkyl chain length
-	-	20	2.0-7.5	CH_3CN/H_2O=60/40	For DNPH-derivatized aldehydes
-	-	20	2.0-7.5	CH_3CN/H_2O=60/40	For DNPH-derivatized aldehydes, enables rapid analysis
-	-	20	2.0-9.0	CH_3CN/H_2O=60/40	For oligonucleotides analysis (single-stranded DNA up to XX+mer)
-	-	20	2.0-7.5	CH_3CN/H_2O=40/60	For direct injection analysis of biological samples, proteins pass through the column
-	-	20	1.4-9.5	CH_3CN/H_2O=60/40	For 16 PAHs analysis specified by EPA610
-	-	10-40	-	-	For sugars, sugar alcohols, and organic acids analysis

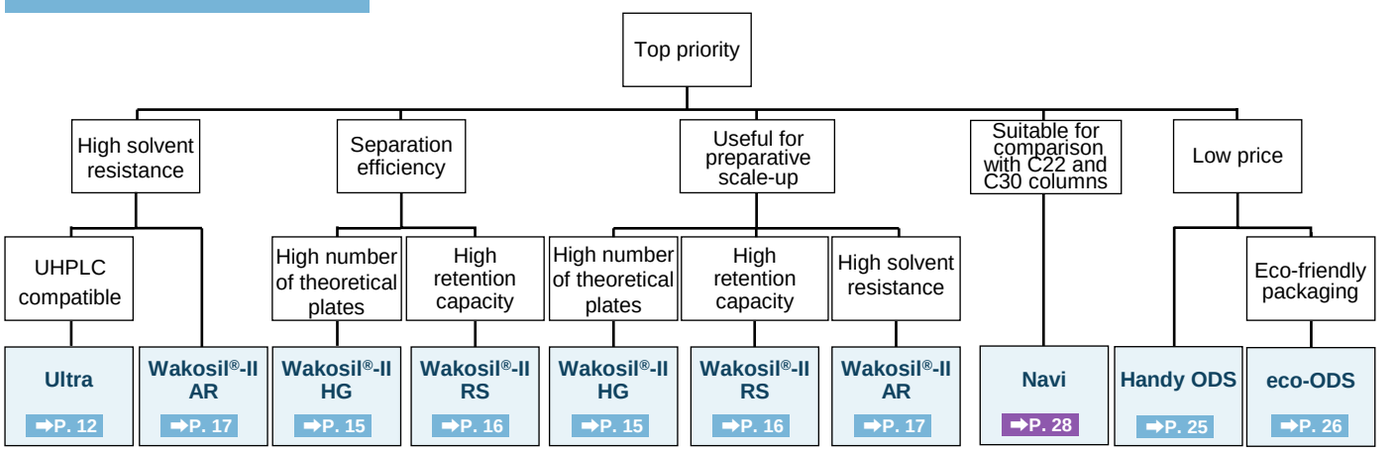
Selection by USP Number

USP L No.	Functional Group	Definition	Particle Size (μm)	Wakopak	
L1	C18	Octadecyl silane chemically bonded to porous or nonporous silica particles or superficially porous particles or ceramic micro-particles, 1.5 to 10 μm in diameter, or a monolithic rod.	1.5-10.0	Combi ODS	➡P. 46
				Combi ODS fast	➡P. 46
				eco-ODS	➡P. 26
				Handy ODS	➡P. 25
				Navi C18-5	➡P. 28
				Ultra C18-2	➡P. 12
				Ultra C18-3	➡P. 12
				Ultra C18-5	➡P. 12
				Wakosil®-II 3C18 AR	➡P. 17
				Wakosil®-II 3C18 HG	➡P. 15
				Wakosil®-II 3C18 RS	➡P. 16
				Wakosil® 5C18	➡P. 22
				Wakosil®-II 5C18-100	➡P. 15
				Wakosil® 5C18-200	➡P. 22
				Wakosil® 5C18 AR	➡P. 22
				Wakosil®-II 5C18 AR	➡P. 17
				Wakosil®-II 5C18 AR Prep	➡P. 20
				Wakosil®-II 5C18 HG	➡P. 15
				Wakosil®-II 5C18 HG Prep	➡P. 19
				Wakosil® 5C18N	➡P. 23
				Wakosil® 5C18-200N	➡P. 24
				Wakosil®-II 5C18 RS	➡P. 16
				Wakosil®-II 5C18 RS Prep	➡P. 20
				Wakosil® 5C18T	➡P. 22
				Wakosil® 5C18-200T	➡P. 23
				Wakosil® 7C18	➡P. 22
				Wakosil® 10C18	➡P. 22
				Wakosil® 10C18-200	➡P. 22
				Wakosil®-Cu	➡P. 49
				Wakosil®-PAHs	➡P. 47
L3	SIL	Porous silica particles or superficially porous particles, 1.5 to 10 μm in diameter, or a monolithic rod.	1.5-10.0	Wakosil® 5SIL	➡P. 40
				Wakosil® 5SIL-120	➡P. 40
				Wakosil®-II 5SIL-AQ	➡P. 42
				Wakosil®-II 5SIL Prep	➡P. 41
				Wakosil® 7SIL-120	➡P. 40
				Wakosil® 10SIL	➡P. 40
L7	C8	Octylsilane chemically bonded to totally porous or superficially porous silica particles 1.5 to 10 μm in diameter, or a monolithic rod.	1.5-10.0	Wakosil®-II 3C8-100 HG	➡P. 33
				Wakosil®-II 3C8 RS	➡P. 34
				Wakosil® 5C8	➡P. 32
				Wakosil®-II 5C8 HG	➡P. 33
				Wakosil®-II 5C8 RS	➡P. 34
L8	NH_2	Aminopropylsilane chemically bonded to totally porous silica gel	1.5-10.0	Wakosil® 5NH_2	➡P. 44
L10	CN	Nitrile groups chemically bonded to porous silica particles or superficially porous particles, 1.5 to 10 μm in diameter.	1.5-10.0	Combi CN	➡P. 46
				Wakosil® 5CN	➡P. 43
				Wakosil®-II 5CN	➡P. 43
L11	Ph	Porous silica gel with chemically bonded phenyl groups.	1.5-10.0	Wakosil® 5Ph	➡P. 36
L13	C1	Porous silica gel chemically bonded with trimethyl groups.	3-10	Wakosil® 5TMS	➡P. 30
L20	Diol	Dihydropropane groups chemically bonded to porous silica particles, 1.5 to 10 μm in diameter.	1.5-10.0	Wakosil® 5Diol-60	➡P. 45
				Wakosil® 5Diol-120	➡P. 45
				Wakosil® 5Diol-200	➡P. 45
				Wakosil® 5Diol-300	➡P. 45
L26	C4	Butyl silane chemically bonded to totally porous or superficially porous silica particles, 1.5 to 10 μm in diameter.	1.5-10.0	Wakosil® 5C4	➡P. 32
				Wakosil® 5C4-200	➡P. 32
L33	Diol	Packing having the capacity to separate dextrans by molecular size over a range of 4 to 500 kDa. It is spherical, silica-based, and processed to provide pH stability.	-	Wakosil® 5Diol-60	➡P. 45
				Wakosil® 5Diol-120	➡P. 45
				Wakosil® 5Diol-200	➡P. 45
				Wakosil® 5Diol-300	➡P. 45
L59	Diol	Packing having the capacity to separate proteins by molecular weight over the range of 5 to 7000 kDa. The packing is spherical 1.5 - 10 μm silica or hybrid packing with a hydrophilic coating.	1.5-10.0	Wakosil® 5Diol-60	➡P. 45
				Wakosil® 5Diol-120	➡P. 45
				Wakosil® 5Diol-200	➡P. 45
				Wakosil® 5Diol-300	➡P. 45
L62	C30	Porous silica gel chemically bonded with C30 group.	3-15	Navi C30-5	➡P. 29
L118	C18	Aqueous polymerized C18 groups on silica particles.	1.2-5.0	Wakosil®-PAHs	➡P. 47
L##	Fluorinated silicone	Spherical silica gel chemically bonded with fluorocarbon	5	Fluofix®-II 120E	➡P. 37

C18(ODS)

We offer a wide selection of ODS columns with unique features. Please refer to the flowchart and table below to select the optimal column.

Selection by Purpose



Selection by Feature

Wakopak	Ultra C18 ➡P. 12	Navi ➡P. 28	Wakosil®-II HG ➡P. 15	Wakosil®-II RS ➡P. 16	Wakosil®-II AR ➡P. 17	Wakosil® ➡P. 21	Handy ODS/eco-ODS ➡P. 25
Features	-Max pressure/ solvent resistance higher than Wakosil®-II AR -Compatible with UHPLC	-Can compare C18/22/30 packing materials; enhanced stereoselectivity of C22/30 for structurally related compounds.	-High number of theoretical plates	-High retention capacity -High separation efficiency in aqueous mobile phases	-High pressure/ solvent resistance -High stereo-selectivity	-Can compare various end-cap type and C% of packing materials	-Low price -Eco-friendly packaging
Applications	-Analysis with acidic/ basic mobile phases -UHPLC analysis	-Analysis of structurally related compounds	-First choice	-Analysis of compounds with a wide polarity range -Separation of closely eluting peaks	-Analysis with acidic/ basic mobile phases -Analysis of structurally related compounds	-Can compare retention capacity and analysis time by end-cap treatment and C%	-Routine Analysis
Particle Size (µm)	2, 3, 5	5	3, 5	3, 5	3, 5	5 , 7, 10	5
Preparative Column (Prep Series) ➡P. 18	-	-	✓	✓	✓	-	-

Wakopak Ultra

This series consists of HPLC columns that use a packing material in which spherical silica gel is modified with octadecyl (C18) groups, and residual silanol groups are minimized through end-cap treatment. ➡P. 5
Compared to other Wakopak series columns, these have fewer residual silanol groups and exhibit high durability even with acidic or basic mobile phases in the pH range of 1.5 to 10.0. Furthermore, since this series is available in particle sizes of 2, 3, and 5 µm, it facilitates a smooth transition from HPLC to UHPLC analytical conditions.

Column Information

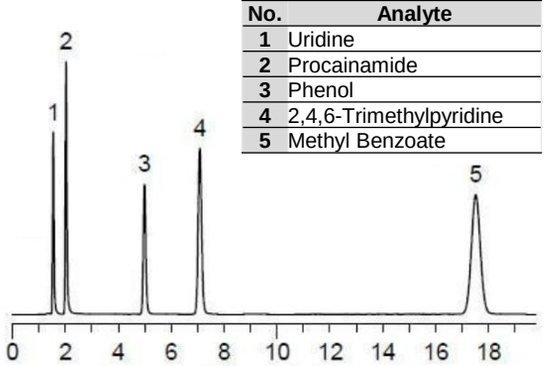
Silica Gel	Spherical Silica Gel	**Pore Size**	C18-2: 10 nm	**Functional Group**	Octadecyl (C18)
Particle Size	C18-2: 2 µm		C18-3: 13 nm	**Bonding Type**	Polymeric
	C18-3: 3 µm		C18-5: 13 nm	**Endcapping**	✓
	C18-5: 5 µm	**Pore Volume**	C18-2: 0.9 mL/g	**C%**	16%
Specific Surface Area	340 m^2/g		C18-3: 1.1 mL/g	**USP L No.**	L1
			C18-5: 1.1 mL/g	**pH Range**	1.5-10.0

Features

✓ **Available in particle sizes of 2 µm, 3 µm, and 5 µm, allowing for an easy transition from HPLC to UHPLC**

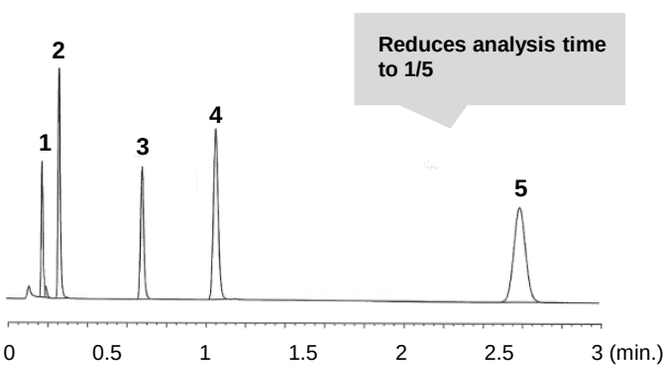
Ultra C18-5 (particle size: 5 µm)

No.	Analyte
1	Uridine
2	Procainamide
3	Phenol
4	2,4,6-Trimethylpyridine
5	Methyl Benzoate



Transition to UHPLC

Ultra C18-2 (particle size: 2 µm)

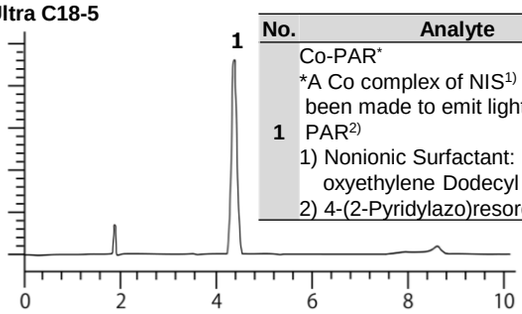


Reduces analysis time to 1/5

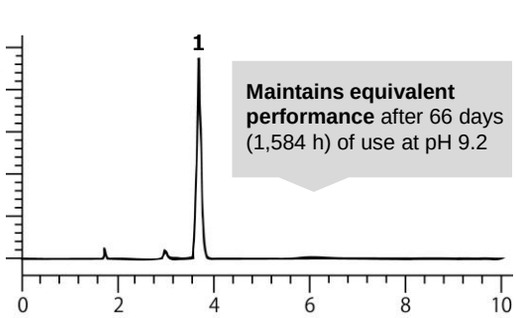
✓ **Effective end-capped provides a wide usable pH range (pH 1.5-10)**

Ultra C18-5

No.	Analyte
1	Co-PAR* *A Co complex of NIS[1)] that has been made to emit light by PAR[2)] 1) Nonionic Surfactant: Hepta-oxyethylene Dodecyl Ether 2) 4-(2-Pyridylazo)resorcinol

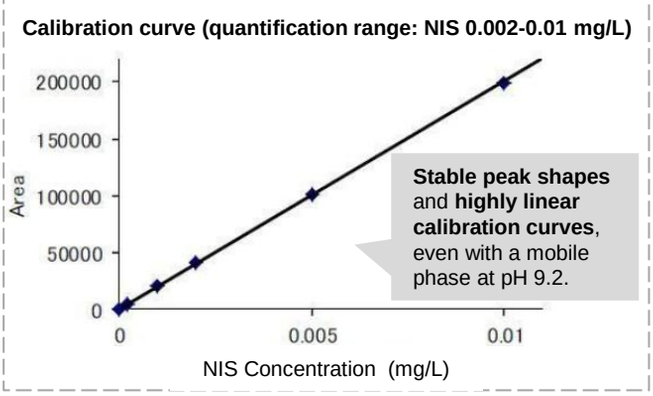


Stable operation for 66 days (1,584 h) using a pH 9.2 mobile phase



Maintains equivalent performance after 66 days (1,584 h) of use at pH 9.2

Calibration curve (quantification range: NIS 0.002-0.01 mg/L)



Stable peak shapes and **highly linear calibration curves**, even with a mobile phase at pH 9.2.

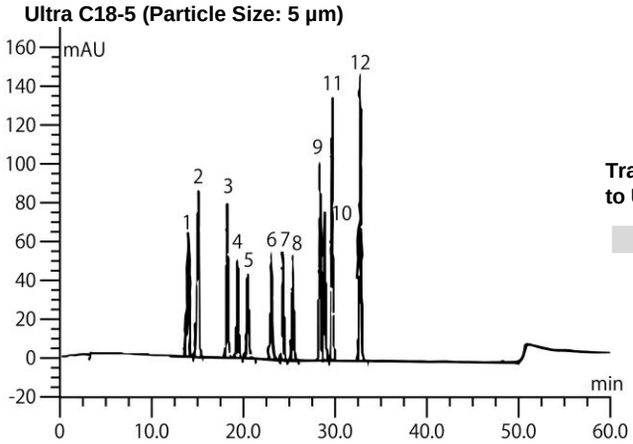
Analysis condition

Column : Ultra C18-5 4.6 mm ×150 mm
Colum temperature : 40°C
Mobile phase : 0.01mol/L $Na_2B_4O_7$ (pH9.2)/CH_3OH = 62/38 (v/v)
Flow rate : 1.0 mL/min.
Detection : 510 nm

Analysis Example

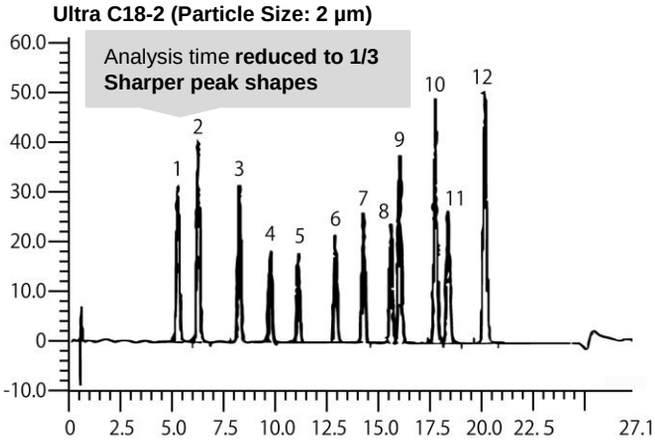
Example of simultaneous analysis of soy Isoflavones[1)]

Ultra C18-5 (Particle Size: 5 µm)



Transition to UHPLC

Ultra C18-2 (Particle Size: 2 µm)



No.	Analyte	No.	Analyte	No.	Analyte	No.	Analyte
1	Daidzin	**4**	6"-*O*-Malonyldaidzin	**7**	6"-*O*-Acetyldaidzin	**10**	Genistein
2	Glycitin	**5**	6"-*O*-Malonylglycitin	**8**	6"-*O*-Acetylgenistin	**11**	Glycitein
3	Genistin	**6**	6"-*O*-Malonylgenistin	**9**	Daidzein	**12**	6"-*O*-Acetylglycitin

Analysis condition

		HPLC	UHPLC
Column	:	Ultra C18-5 4.6 mm × 150 mm	Ultra C18-2 3.0 mm × 75 mm
Column temperature	:	40°C	
Mobile phase	:	A) 25 mM $NH_4H_2PO_4$ (pH 4.0) B) CH_3OH	

Time (min.)	B conc. (%)
0-1	25
1-40	25-70
40-45	70
45-45.1	70-25

Time (min.)	B conc. (%)
0-1	25
1-23	25-50

Flow rate	:	0.5 mL/min.	0.3 mL/min.
Detection	:	UV 254 nm	

1) Ozaki, I.: *Wako Junyaku Jiho*, **81 (2)**, 12 (2013).

Click here for details
Home > Analysis > Liquid Chromatography > Reversed-Phase Partition Chromatography (C18) > Wakopak Ultra Series (C18) (for UHPLC)
https://labchem-wako.fujifilm.com/asia/category/00480.html

Wakopak Wakosil®-II

This series consists of HPLC columns that use packing materials based on high-purity silica gel, enhanced with features such as a high theoretical plate number and compatibility with aqueous mobile phases. To support analytical validation, this series guarantees the “physical properties of the silica gel substrate” and the “properties of packing materials after chemical modification,” tailored to the characteristics of each series.

Comparison of the Wakopak Wakosil®-II Series

Wakopak	Wakosil®-II HG ➡P. 15	Wakosil®-II RS ➡P. 16	Wakosil®-II AR ➡P. 17	Wakosil®-II 5C18-100 ➡P. 15
Features	High number of theoretical plates	High separation efficiency in aqueous mobile phases	High pressure/solvent resistance, high stereoselectivity	High retention capacity
Applications	First choice	Analysis of compounds with a wide polarity range	Analysis of peptides and structural isomers, analysis with acidic/basic mobile phases	Analysis of high polarity compounds
Functional Group	C18, C8	C18, C8	C18	C18
Particle Size (µm)	3, 5	3, 5	3, 5	5
Bonding Type	Monomeric	Monomeric	Polymeric	Monomeric
Preparative Column (Prep Series) ➡P. 18	✓	✓	✓	-

Wakosil®-II HG

This product provides the highest number of theoretical plates in the Wakopak series.

Wakosil®-II RS

Due to its large specific surface area, it offers high retention capacity. Because of the thorough end-cap treatment ➡P. 5 , it provides high separation and retention performance even with aqueous mobile phases, making it suitable for the separation of highly polar compounds.

Wakosil®-II AR

Due to its chemically modified polymeric structure ➡P. 5 , it exhibits excellent stereoselectivity. Furthermore, because it demonstrates extremely high durability, it can be used with mobile phases over a wide pH range.

Features

- ✓ Uses **high-purity silica gel** with low metal content
- ✓ A lineup of **series with unique features** (AR, HG, RS)
- ✓ Offers a lineup of column sizes tailored to specific applications, including **preparative columns (Prep Series)** ➡P. 18
- ✓ Guarantees the **“physical properties of the silica gel substrate”** and the **“properties of packing materials after chemical modification,”** tailored to the characteristics of each series.*

* Wakosil®-II HG, RS, AR only.

Specification of Wakopak Wakosil®-II Series (Physical Properties of the Silica Gel Substrate, Properties of Packing Materials after Chemical Modification)

Wakopak		Wakosil®-II HG		Wakosil®-II RS		Wakosil®-II AR	
Particle Size (µm)		3	5	3	5	3	5
Particle Size Distribution (Silica Gel Substrate)	**d50 (µm)**	3.2-3.7	4.2-4.7	3.0-3.7	4.2-4.7	3.2-3.7	4.2-4.7
	d10 (µm)	d10 ≧d50-1.5	d10≧d50-1.5	d10≧d50-1.5	d10≧d50-1.5	d10≧d50-1.5	d10≧d50-1.5
	d90 (µm)	d90≧d50+1.5	d90≧d50+1.5	d90≧d50+1.5	d90≧d50+1.5	d90≧d50+1.5	d90≧d50+1.5
Pore Size (Silica Gel Substrate) (nm)		11.0-13.0	11.0-13.5	9.5-11.5	11.0-13.0	11.0-13.0	11.0-14.5
Specific Surface Area (Silica Gel Substrate) (m^2/g)		280-320	270-310	390-430	390-430	280-320	270-320
Pore Volume (Silica Gel Substrate) (mL/g)		0.85-1.00	0.90-1.10	0.95-1.10	1.15-1.30	0.85-1.00	0.85-1.00
C%		13.0-17.0	13.0-17.0	16.0-18.0	16.0-18.5	17.0-22.0	17.0-22.0
Number of Theoretical Plates (Naphthalene)		≧18,000	≧23,000	≧16,000	≧21,500	≧17,000	≧21,500
Capacity Factor (Naphthalene)		3.3-4.1	3.2-4.1	4.6-5.2	3.7-4.4	2.7-3.6	2.0-3.0
Separation Factor	**Naphthalene/Benzene**	2.0-2.1	2.0-2.1	1.9-2.1	1.9-2.1	1.8-2.1	1.8-2.1
	Dibenz[*a*,*h*]anthracene /Triphenylene	-	-	-	-	≦5.2	≦5.2
	Phenol/Pyridine	-	-	≧2.7	≧2.8	-	-
Symmetry Factor (10% height)	**Naphthalene**	1.0-1.4	1.0-1.4	1.0-1.4	1.0-1.4	1.0-1.4	1.0-1.4
	Procainamide	2.0-4.0	2.0-4.0	1.6-2.8	1.6-2.8	1.5-4.0	1.5-4.0
	2,4,6-Trimethylpyridine	1.5-3.0	1.5-3.0	1.0-2.0	1.0-2.0	3.5-5.5	3.5-5.5
Tailing Factor (10% height)	**Naphthalene**	0.9-1.3	0.9-1.3	0.9-1.3	0.9-1.3	0.9-1.3	0.9-1.3
	Oxine-Cu	1.5-4.0	1.5-4.0	1.0-3.0	1.0-3.0	1.5-4.0	1.5-4.0
Retention Time (min.)	**Dopamine**	-	-	4.0-5.2	7.0-8.5	-	-
	DOPA	-	-	4.0-5.2	7.0-8.5	-	-
Functional Group		C18	C18	C18	C18	C18	C18
USP L No.		L1	L1	L1	L1	L1	L1

Wakopak Wakosil®-II 5C18-100

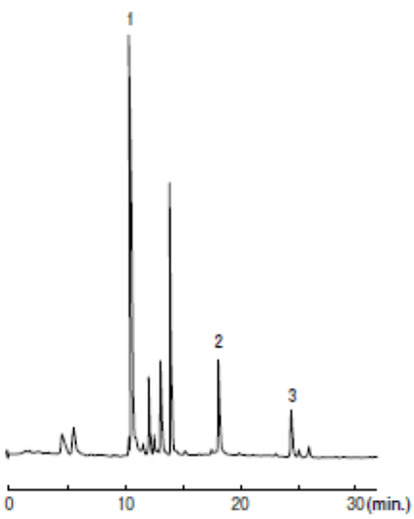
In addition to its high C% content, this product has a small pore size of 10 nm, resulting in a large specific surface area and high retention capacity.

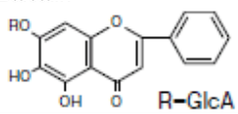
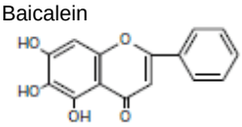
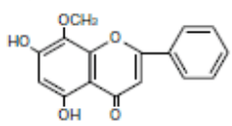
Column Information

Silica Gel	High-purity silica gel with low metal content	**Functional Group**	Octadecyl (C18)	**pH Range**	2.0-7.5
Particle Size	5 µm	**Bonding Type**	Monomeric	**Preparative Column (Prep Series)** ➡P. 18	-
Specific Surface Area	350 m^2/g	**Endcapping**	✓		
Pore Size	10 nm	**C%**	22%		
Pore Volume	1 mL/g	**USP L No.**	L1		

Analysis Example

Analysis of Active Ingredients in Ougon



No.	Analyte
1	Baicalin 
2	Baicalein 
3	Wogonin 

Analysis condition

Column : Wakosil®-II 5C18-100 4.6 mm × 150 mm

Colum temperature : 50°C

Mobile phase : A) 0.1 M H_3PO_4
B) CH_3CN/0.1 M H_3PO_4 (v/v) = 50/50 (v/v)

Time (min.)	B conc. (%)
0-20	40-100
20-30	100

Flow rate : 1.0 mL/min.

Detection : UV 280 nm

Wakopak Wakosil®-II HG

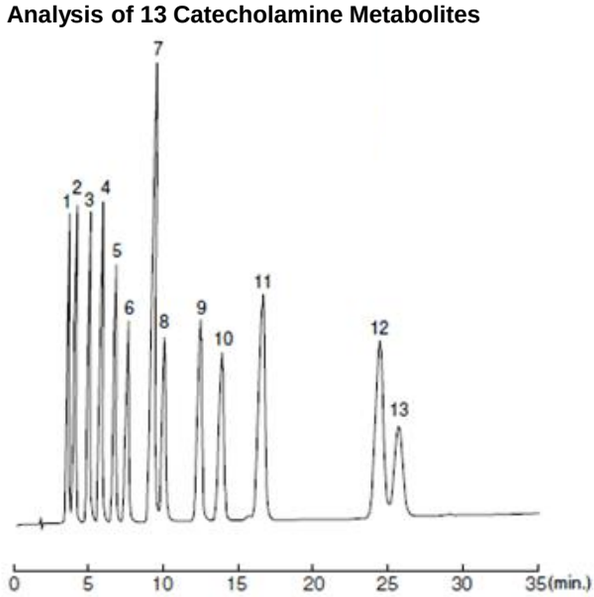
This product has the highest number of theoretical plates (approximately 15,000 plates for a column size of 4.6 mm × 150 mm) among our column products.

Column Information

Silica Gel	High-purity silica gel with low metal content	**Functional Group**	Octyl (C8) ➡P. 33	**USP L No.**	C8 : L7
Particle Size	C8 : 5 µm		Octadecyl (C18)		C18: L1
	C18: 3 µm, 5 µm	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Specific Surface Area	300 m^2/g	**Endcapping**	✓	**Preparative Column (Prep Series)** ➡P. 18	C8 : ×
Pore Size	12 nm	**C%**	C8 : 10%		C18: ✓
Pore Volume	1.0 mL/g		C18: 15%		

Analysis Example

Analysis of 13 Catecholamine Metabolites



No.	Analyte	No.	Analyte	No.	Analyte
1	MHPG	6	NM	11	IP
2	NE	7	5HIAA	12	5HT
3	E	8	DA	13	3MT
4	DOPAC	9	Trp		
5	DFBA	10	HVA		

Analysis condition

Column : Wakosil®-II 5C18HG 4.6 mm × 150 mm

Column temperature : 35°C

Mobile phase : SOS 240 mg/L in [CH_3OH/0.1 M KH_2PO_4 +H_3PO_4 (pH 3.9) = 10/90 (v/v)]

Flow rate : 1.0 mL/min.

Detection : ECD + 800 mV

Analysis of Aromatic Compounds ➡P. 33

Wakopak Wakosil®-II RS

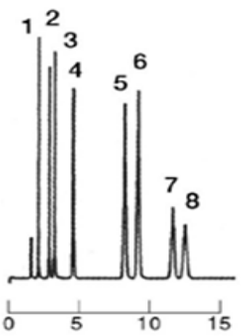
This product has undergone thorough end-cap treatment ➡P. 5 and can be used even with water-based mobile phases. As a result, mixed samples with a wide range of polarities and basic compounds can be analyzed without tailing. It also has a large specific surface area and exhibits high retention capacity.

Column Information

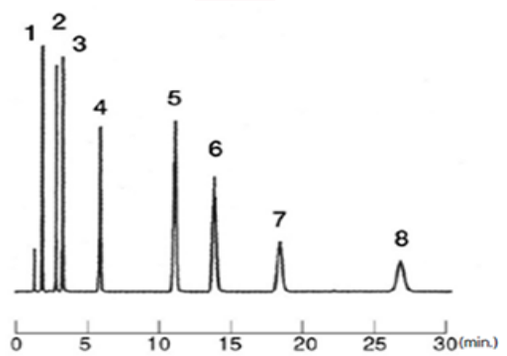
Silica Gel	High-purity silica gel with low metal content	**Pore Volume**	C8 : 1.0 mL/g	**C%**	C8 : 10%
Particle Size	3 µm, 5 µm		C18: 1.0 mL/g (Particle size: 3 µm)		C18: 17%
Specific Surface Area	C8 : 400 m^2/g		1.2 mL/g (Particle size: 5 µm)	**USP L No.**	C8 : L7
	C18: 410 m^2/g	**Functional Group**	Octyl (C8) ➡P. 34		C18: L1
Pore Size	C8 : 10 nm (粒子径: 3 µm)		Octadecyl (C18)	**pH Range**	2.0-7.5
	12 nm (粒子径: 5 µm)	**Bonding Type**	Monomeric	**Preparative Column (Prep Series)** ➡P. 18	C8 : -
	C18: 11 nm(粒子径: 3 µm)	**Endcapping**	✓		C18: ✓
	12 nm(粒子径: 5 µm)				

Analysis Example

Analysis of Water-soluble Vitamins



Wakosil®-II 5C8 RS ➡P. 34



Wakosil®-II 5C18 RS

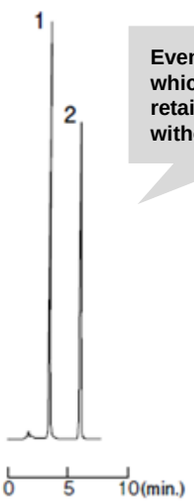
No.	Analyte	No.	Analyte
1	L(+)-Ascorbic Acid (V. C)	5	Caffein
2	Nicotinic Acid	6	Thiamine (V. B_1)
3	Nicotinamide	7	D-Biotin (V. H)
4	Pyridoxine Hydrochloride (V. B_6)	8	Riboflavin (V. B_2)

Analysis condition

Column size : 4.6 mm × 150 mm
Column temperature : 40°C
Mobile phase : CH_3OH/5 mM SHS* in 0.1% H_3HPO_4 = 10/90 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 210 nm

* 1-Hexanesulfonic Acid Sodium Salt

Analysis of Procainamide/Phenol



Even procainamide, which is highly polar, is retained sufficiently without tailing.

No.	Analyte	No.	Analyte
1	Procainamide Hydrochloride	2	Phenol

Analysis condition

Column : Wakosil®-II 5C18RS 4.6 mm × 150 mm
Column temperature : 30°C
Mobile phase : CH_3OH/20 mM K_2HPO_4 (pH 7.6) = 40/60 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Analysis of Tricyclic Antidepressants ➡P. 34

Wakopak Wakosil®-II AR

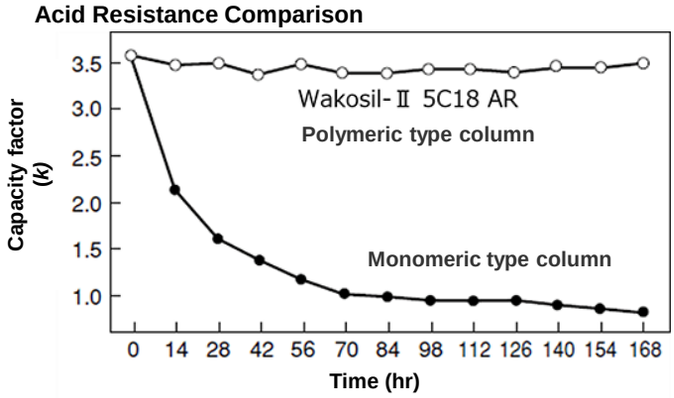
This product is a column using a polymeric-type ➡P. 5 ODS packing material. Even when the mobile phase is acidic (pH 1.4), the ODS is resistant to hydrolysis, resulting in exceptionally high durability. Due to the characteristics of polymeric ODS bonding, the separation behavior may differ from that of conventional monomeric ODS silica gels. Therefore, it is useful for the separation of peptides and structural isomers.

Column Information

Silica Gel	High-purity silica gel with low metal content	**Functional Group**	Octadecyl (C18)	**pH Range**	1.4-9.4
Particle Size	3 µm, 5 µm	**Bonding Type**	Polymeric	**Preparative Column (Prep Series)** ➡P. 18	✓
Specific Surface Area	300 m^2/g	**Endcapping**	✓		
Pore Size	12 nm	**C%**	20%		
Pore Volume	1 mL/g	**USP L No.**	L1		

Durability Information

Acid Resistance Comparison



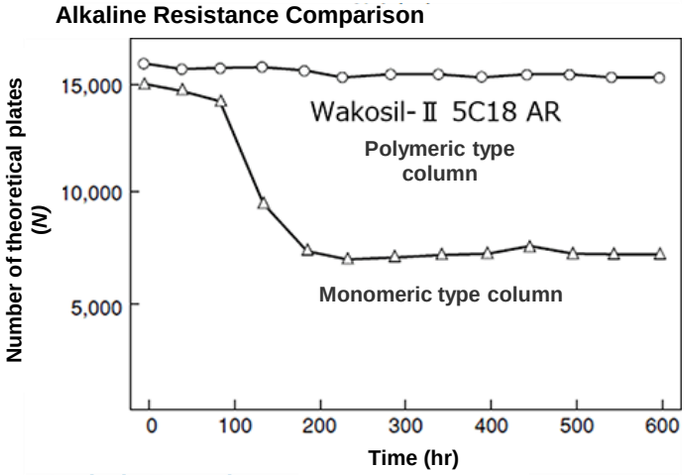
Analysis condition

Column : Wakosil®-II 5C18 AR 4.6 mm × 150 mm
Column temperature : R.T.
Mobile phase : CH_3CN/H_2O = 40/60 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Analytical procedure

After eluting a 1.0% aqueous solution of trifluoroacetic acid (pH 1.4) through columns packed with each packing material, the columns were left to stand in a constant-temperature bath at 60°C, and the capacity factor (*k*) of the naphthalene peak (with the uracil peak set as t_0) was measured every 14 hours.

Alkaline Resistance Comparison



Analysis condition

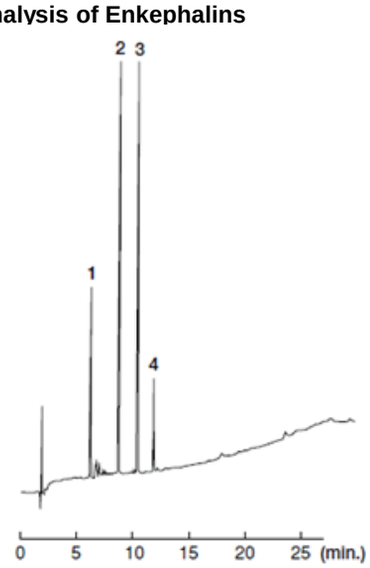
Column : Wakosil®-II 5C18 AR 4.6 mm × 150 mm
Column temperature : 40°C
Mobile phase : 40% CH_3CN in 20 mM Na_2HPO_4 (pH9.4)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Analytical procedure

After continuously eluting the mobile phase (pH 9.4) through columns packed with each packing material, the peak of *N*,*N*-Dimethylaniline was measured at predetermined intervals, and the number of theoretical plates (*N*) was calculated.

Analysis Example

Analysis of Enkephalins



No.	Analyte	No.	Analyte
1	Arg-Vasopressin	3	Leu-Enkephalin
2	Met-Enkephalin	4	Substance P

Analysis condition

Column : Wakosil®-II 5C18 AR 4.6 mm × 150 mm
Column temperature : 40°C
Mobile phase : A) H_2O 0.1% TFA B) CH_3CH 0.1% TFA

Time (min.)	B conc. (%)
0-25	10-60
25-30	60

Flow rate : 1.0 mL/min.
Detection : UV 220 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C18) > Wakopak Wakosil®-II 5C18 HG, RS, AR
https://labchem-wako.fujifilm.com/asia/category/01081.html

Wakopak Wakosil®-II Prep (Preparative Column)

This series consists of preparative columns packed with the same packing material as the Wakosil®-II series. This enables a smooth transition between analytical conditions during preparative chromatography.

Comparison of the Wakosil®-II Prep Series

Wakopak	Wakosil®-II HG Prep ➡P. 19	Wakosil®-II RS Prep ➡P. 20	Wakosil®-II AR Prep ➡P. 20	Wakosil®-II 5SIL Prep ➡P. 41
Features	High number of theoretical plates	High separation efficiency in aqueous mobile phases	High pressure/solvent resistance, high stereoselectivity	Available in normal phase chromatography
Applications	First choice	Preparative separation of compounds with a wide polarity range	Preparative separation of peptides and structural isomers, preparative separation acidic/basic mobile phases	Preparative separation of compounds that are difficult to separate in reversed-phase chromatography, compounds prone to hydrolysis, and polar compounds.
Functional Group	C18	C18	C18	OH (Unmodified)
Particle Size (µm)	5	5	5	5
Bonding Type	Monomeric	Monomeric	Polymeric	-

Wakosil®-II HG
This product provides the highest number of theoretical plates in the Wakopak series.

Wakosil®-II RS
Due to its large specific surface area, it offers high retention capacity. Because of the thorough end-cap treatment ➡P. 5, it provides high separation and retention performance even with aqueous mobile phases, making it suitable for the separation of highly polar compounds.

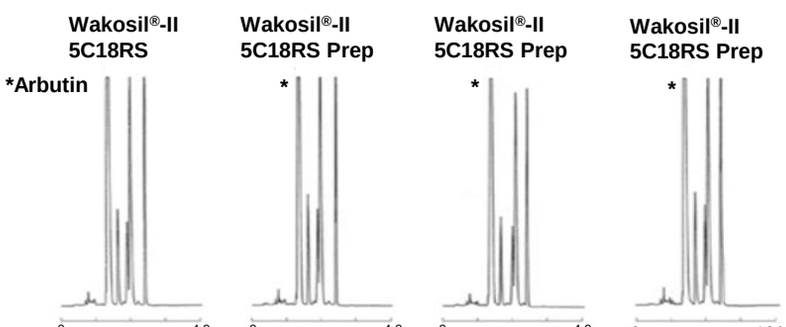
Wakosil®-II AR
Due to its chemically modified polymeric structure ➡P. 5, it exhibits excellent stereoselectivity. Furthermore, because it demonstrates extremely high durability, it can be used with mobile phases over a wide pH range.

Setting Up Preparative Conditions

1. Determine the preparative conditions using an analytical column (4.6 mm × 250 mm).
2. Set the sample load (injection volume) and flow rate based on the ratio of the cross-sectional areas of the analytical column and the preparative column.
3. Perform the preparative separation using the preparative column.

Example of Preparative Separation of Arbutin

Suppose we scale up the analysis of arbutin, which was originally performed on a Wakosil®-II 5C18RS column with an inner diameter of 4.6 mm, to Prep series columns with inner diameters of 20, 33, and 50 mm (all with the same packing material, particle size, and column length). By increasing the flow rate and injection volume in proportion to the cross-sectional area ratio*, we expect to obtain nearly identical chromatograms. Looking at the actual chromatograms shown below, it is clear that nearly equivalent results were obtained in terms of peak shape, peak width, and retention times for each analyte. Thus, using the Wakosil®-II Prep series allows for easy scale-up, as columns with different inner diameters but the same packing material can be compared.*Regarding the setting of sample loading, there are two methods: concentration loading, in which the injection volume is fixed and the sample concentration is increased, and volume loading, in which the sample concentration is fixed and the injection volume is increased. In this test, the volume loading method was used.



Analysis condition

Colum temperature : R.T.
Mobile phase : A) CH_3COOH/H_2O = 1/99 (v/v)
B) CH_3CN/H_2O = 30/70 (v/v)
Gradient :

Time (min.)	B conc. (%)
0-19	0
19-37	100
37-41	0

Detection : UV 280 nm

Inner diameter	4.6 mm × 250 mm	20 mm × 250 mm	33 mm × 250 mm	50 mm × 250 mm
Cross-sectional area ratio*	1	19	51	118
Flow rate	0.8 mL/min.	15.1 mL/min.	41.2 mL/min.	92.6 mL/min.
Injection volume	20 µL	380 µL	1.0 mL	2.3 mL
Column pressure	45 kg/cm²	46 kg/cm²	49 kg/cm²	44 kg/cm²

Set to approximately 19, 51, and 118 times, respectively, in proportion to their cross-sectional area ratios

Set to approximately 19, 51, and 118 times, respectively, in proportion to their cross-sectional area ratios

Even after scaling up, the column pressure remains nearly the same

* Cross-sectional area ratio, with the cross-sectional area of a column with an inner diameter of 4.6 mm set to 1. Cross-sectional area = radius × radius × 3.14 (π).

Wakopak Wakosil®-II HG Prep

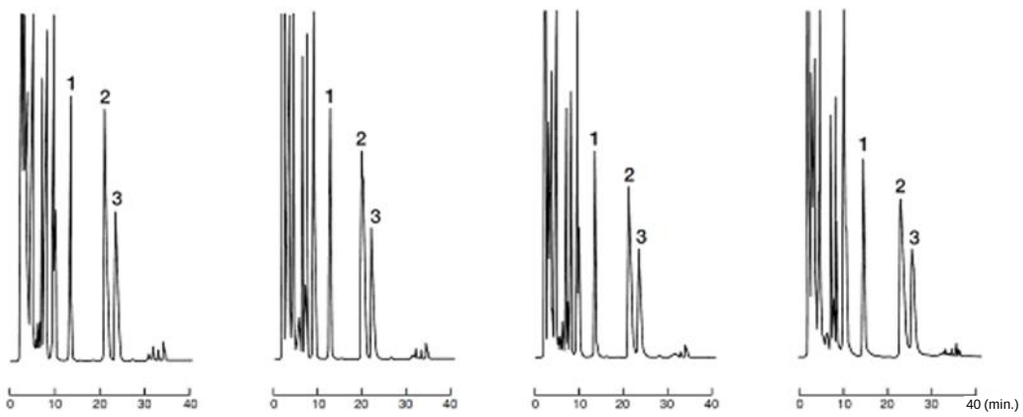
This product has the highest number of theoretical plates among our preparation columns.

Column Information

Silica Gel	High-purity silica gel with low metal content	**Pore Volume**	1 mL/g	**C%**	16%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**Inner Diameter**	4.6, 10, 20, 50 mm
Pore Size	12 nm	**Endcapping**	✓	**pH Range**	2.0-7.5

Examples of Preparative Applications

Preparative Separation of Senso



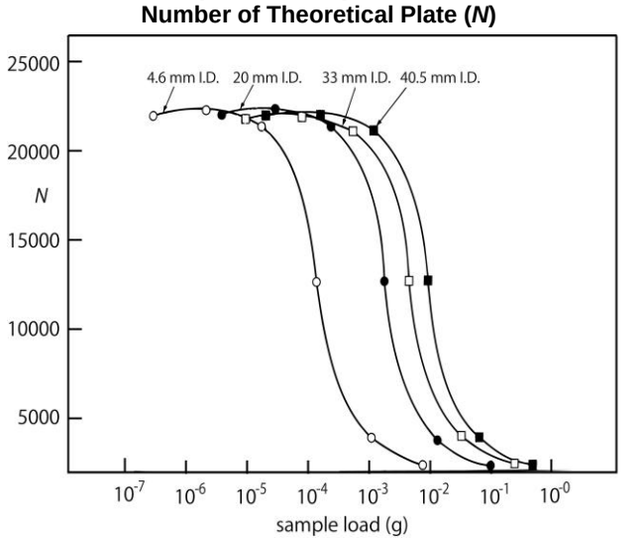
No.	Analyte
1	Bufalin
2	Cinobufagin
3	Resibufogenin

Analysis condition		**Wakosil®-II HG**		**Wakosil®-II HG Prep**	
Column size	:	4.6 mm × 250 mm	20 mm × 250 mm	33 mm × 250 mm	50 mm × 250 mm
Flow rate	:	1.0 mL/min.	18.9 mL/min.	51.5 mL/min.	115.8 mL/min.
Column pressure	:	60 kg/cm^2	54 kg/cm^2	58 kg/cm^2	60 kg/cm^2
Injection volume		20 µL	380 µL	1.0 mL	2.3 mL
Column temperature	:	R.T.			
Mobile phase	:	A) CH_3CN/0.1%CH_3COOH = 40/60 (v/v) B) CH_3CN/0.1%CH_3COOH = 80/20 (v/v)			
Gradient	:				

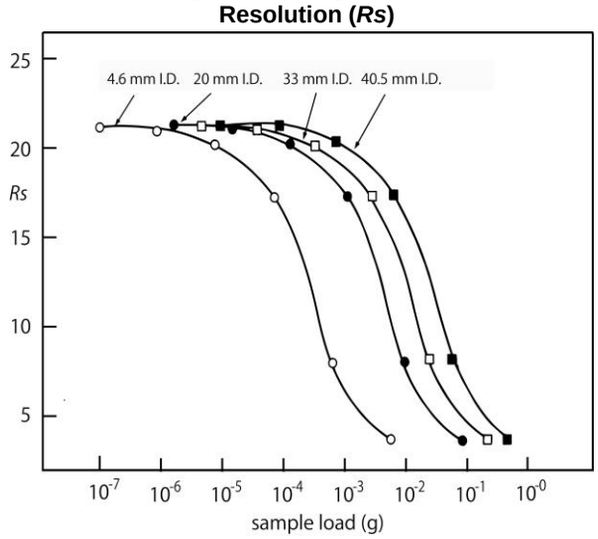
Time (min.)	B conc. (%)
0-28	0
28-40	100

Detection : UV 300 nm

Relationship between Injection Volume and Number of Theoretical Plate (*N*)



Relationship between Injection Volume and Resolution (*Rs*)



Sample : *N*) Dibutyl phthalate

Rs) Dipropyl phthalate, Dibutyl phthalate

Mobile phase : CH_3CN/H_2O=65/35 (v/v)

Wakopak Wakosil®-II RS Prep

This product has undergone thorough end-cap treatment ➡P. 5 and can be used even with water-based mobile phases. As a result, mixed samples with a wide range of polarities and basic compounds can be preparative separated without tailing. It also has a large specific surface area and exhibits high retention capacity.

Column Information

Silica Gel	High-purity silica gel with low metal content	**Pore Volume**	1.2 mL/g	**C%**	17%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	400 m^2/g	**Bonding Type**	Monomeric	**Inner Diameter**	4.6, 10, 20, 50 mm
Pore Size	12 nm	**Endcapping**	✓	**pH Range**	2.0-7.5

Examples of Preparative Applications

Preparative Separation of Arbutin ➡P. 18

Wakopak Wakosil®-II AR Prep

This product is a column using a polymeric-type ➡P. 5 ODS packing material. Even when the mobile phase is acidic (pH 1.4), the ODS is resistant to hydrolysis, resulting in exceptionally high durability. Due to the characteristics of polymeric ODS bonding, the separation behavior may differ from that of conventional monomeric ODS silica gels. Therefore, it is useful for the preparative separation of peptides and structural isomers. ➡P. 17

Column Information

Silica Gel	High-purity silica gel with low metal content	**Pore Volume**	1 mL/g	**Inner Diameter**	4.6, 10, 20, 50 mm
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**pH Range**	1.4-9.4
Specific Surface Area	300 m^2/g	**Bonding Type**	Polymeric	**C%**	18%
Pore Size	12 nm	**Endcapping**	✓	**USP L No.**	L1

Click here for details
TOP > Analytical Chemistry > Chromatography > Liquid Chromatography (LC)
> Wakopak Wakosil®-II Prep Series (C18, SIL) (for Preparative Chromatography)
https://labchem-wako.fujifilm.com/asia/category/01059.html

Wakopak Wakosil® Series

This series consists of standard HPLC columns in the Wakopak series, utilizing packing materials based on high-purity spherical porous silica gel. Columns are available with three levels of end-cap type ➡P. 5 : high-end-capped, end-capped, and end-capped.

Comparison of the Wakopak Wakosil® Series

Wakopak	High-end-capped			End-capped		Non-end-capped	
	Wakosil® C4/C8/C18 ➡P. 22	Wakosil® 5C18 AR ➡P. 22	Wakosil® C4-200/C18-200 ➡P. 22	Wakosil® 5C18T ➡P. 22	Wakosil® 5C18-200T ➡P. 23	Wakosil® 5C18N ➡P. 23	Wakosil® 5C18-200N ➡P. 24
Features	Standard performance	Stereoselectivity, High durability	Small specific surface area	Reversed-phase distribution and adsorption due to trace silanol groups	Reversed-phase distribution and adsorption due to trace silanol groups, small specific surface area	Adsorption due to silanol groups	Adsorption due to silanol groups, small specific surface area
Applications	General analysis	Analysis of peptides and structural isomers, analysis using acidic/basic mobile phases	Rapid analysis	Analysis of glycosides, pharmaceuticals, etc.	Rapid analysis of glycosides, pharmaceuticals, etc.	Analysis of positional isomers and structurally related compounds	Rapid analysis of positional isomers and structurally related compounds
Functional Group	C4, C8, C18	C18	C4, C18	C18	C18	C18	C18
Particle Size (µm)	C4 : 5 C8 : 5 C18: 5 , 7, 10	5	C4 : 5 C18: 5, 10	5	5	5	5
Bonding Type	Monomeric	Polymeric	Monomeric	Monomeric	Monomeric	Monomeric	Monomeric

High-end-capped

We apply end-capped treatment using our proprietary surface treatment technology. This ensures excellent peak shape and reproducibility for both acidic and basic compounds.

End-capped

Although this column is end-capped, a small amount of residual silanol groups remains compared with the high-endcapping type. This type is useful for the separation of glycosides and pharmaceuticals through both reversed-phase interactions and weak interactions with residual silanol groups. It provides a good balance between retention and selectivity, particularly for low-polarity compounds.

Non-end-capped

This type is not end-capped. It exhibits stronger silanol interactions than the end-capped type and is useful for the separation of positional isomers and structurally related compounds.

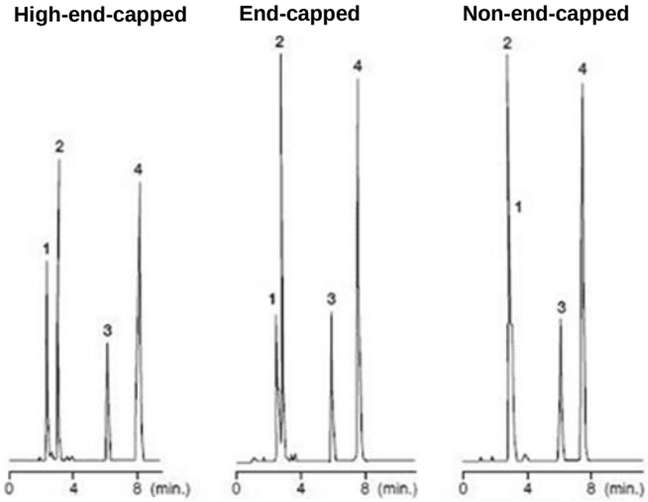
Features

✓ Available with three levels of end-cap type: high-end-capped, end-capped, and non-end-capped.

Comparison of End-cap Types

Analysis of Aromatic Compounds

High-end-capped **End-capped** **Non-end-capped**



Wakosil® 5C18 **Wakosil® 5C18T** **Wakosil® 5C18N**

No.	Analyte	No.	Analyte
1	Pyridine	3	Methyl Benzoate
2	Phenol	4	3-Methylindole

Analysis condition

Column size : 4.6 mm × 150 mm

Mobile phase : CH_3CN/10 mM KH_2PO_4・K_2HPO_4 (pH 7.0)= 50/50 (v/v)

Flow rate : 1.0 mL/min.

Detection : UV 254 nm

Compared to the high-end-capped, in the end-capped and non-end-capped cases, **the behavior of polar compounds changes due to the influence of residual silanol groups.**

Wakopak Wakosil® C4/C8/C18

This is a series of columns with standard performance characteristics.

Column Information

Silica Gel	Spherical Silica Gel	**Functional Group**	Butyl (C4), Octyl (C8) ➡P. 32 , Octadecyl (C18)	**USP L No.**	C4 : L26 C8 : L7 C18: L1
Particle Size	C4 : 5 µm C8 : 5 µm C18: 5 µm, 7 µm, 10 µm	**Endcapping**	✓	**pH Range**	2.0-7.5
Specific Surface Area	300 m^2/g	**C%**	C4 : 8% C8 : 12% C18: 20%		
Pore Size	12 nm				
Pore Volume	1 mL/g				

Analysis Example

Analysis of Aromatic Compounds ➡P. 30

Wakopak Wakosil® 5C18 AR

This column uses a polymeric-type ➡P. 5 ODS packing material, which exhibits extremely high durability because the ODS is resistant to hydrolysis even when the mobile phase is acidic (pH 1.4). Due to the characteristics of polymeric ODS bonding, the separation behavior may differ from that of conventional monomeric ODS silicagels. Therefore, it is useful for the separation of peptides and structural isomers.

Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	17%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Polymeric	**pH Range**	1.4-9.4
Pore Size	12 nm	**Endcapping**	✓		

Wakopak Wakosil® C4-200/C18-200

This product features a low specific surface area of 200 m^2/g, which shortens retention times and enables rapid analysis. Its separation efficiency is comparable to that of the Wakosil® C4/C18.

Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	C4 : 5% C18: 12%
Particle Size	C4 : 5 µm C18: 5 µm, 10 µm	**Functional Group**	Butyl (C4) ➡P. 32 , Octadecyl (C18)	**USP L No.**	C4 : L26 C18: L1
Specific Surface Area	200 m^2/g	**Bonding Type**	Monomeric		
Pore Size	20 nm	**Endcapping**	✓	**pH Range**	2.0-7.5

Analysis Example

Analysis of Bufosteroids ➡P. 24

Wakopak Wakosil® 5C18T

Compared to the high-end-capped type, this product uses a packing material with a small amount of residual silanol groups. It is useful for separating glycosides and pharmaceuticals, etc., by utilizing reversed-phase separation and adsorption onto these residual silanol groups. Furthermore, it exhibits retention characteristics equivalent to those of the high-end-capped type for low-polarity compounds.

Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	20%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Wakopak Wakosil® 5C18-200T

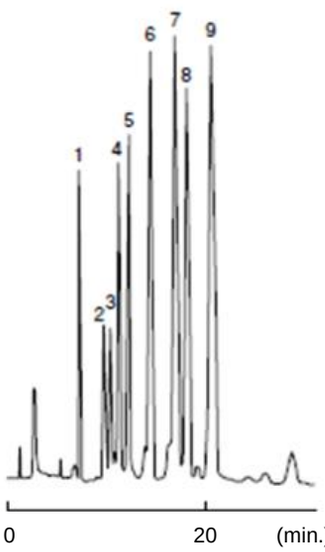
Compared to the high-end-capped type, this product uses a packing material with a small amount of residual silanol groups. It is useful for separating glycosides and pharmaceuticals, etc., by utilizing reversed-phase separation and adsorption onto these residual silanol groups. Furthermore, it exhibits retention characteristics equivalent to those of the high-end-capped type for low-polarity compounds. Compared to Wakosil® 5C18T, this product has a smaller specific surface area and weaker retention, resulting in shorter retention times and enabling rapid analysis.

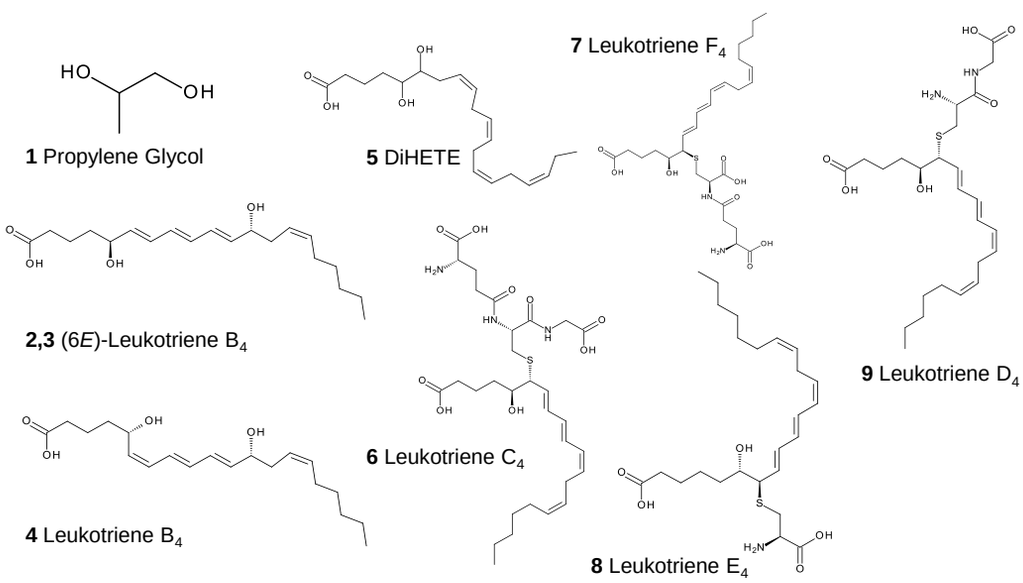
Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	12%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	200 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	20 nm	**Endcapping**	✓		

Analysis Example

Analysis of Leukotrienes





No.	Analyte	No.	Analyte
1	Propylene Glycol	**6**	Leukotriene C_4
2,3	(6*E*)-Leukotriene B_4	**7**	Leukotriene F_4
4	Leukotriene B_4	**8**	Leukotriene E_4
5	DiHETE	**9**	Leukotriene D_4

Analysis condition

Column	:	Wakosil® 5C18-200T 4.6 mm × 150 mm
Column temperature	:	R.T.
Mobile phase	:	CH_3CN/CH_3OH/0.5 mM Sodium Dodecyl Sulfate in 10 mM $NH_4H_2PO_4$ (pH2.5) = 35/20/45 (v/v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 280 nm

Wakopak Wakosil® 5C18N

This product is a non-end-capped type. It exhibits stronger interactions with residual silanol groups than end-capped type, making it useful for the separation and analysis of positional isomers and structurally related compounds.

Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	20%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	-		

Wakopak Wakosil® 5C18-200N

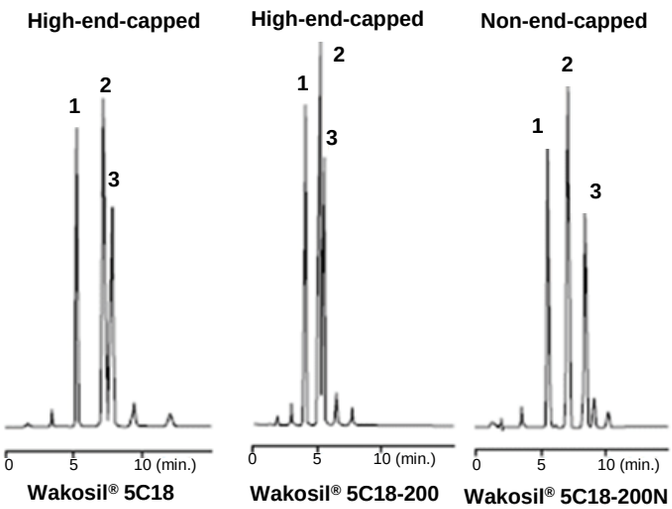
This product is a non-end-capped type. It exhibits stronger interactions with residual silanol groups than end-capped type, making it useful for the separation and analysis of positional isomers and structurally related compounds. Compared to Wakosil® 5C18N, this product has a smaller specific surface area and weaker retention, resulting in shorter retention times and enabling rapid analysis.

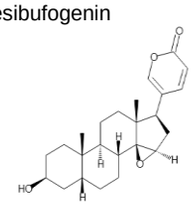
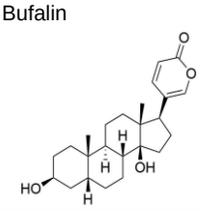
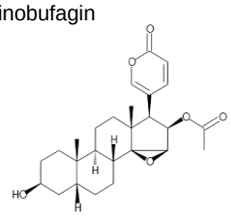
Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	12%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	200 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	20 nm	**Endcapping**	-		

Analysis Example

Analysis of Bufosteroids



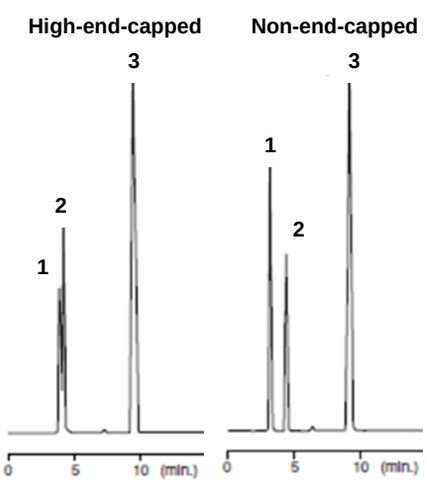
No.	Analyte	No.	Analyte
1	Resibufogenin 	3	Bufalin 
2	Cinobufagin 		

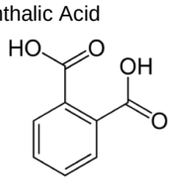
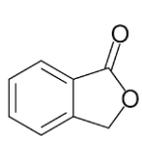
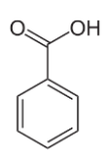
The non-end-capped type provides high retention for polar compounds.

Analysis condition

Column size : 4.6 mm × 150 mm
Column temperature : 30°C
Mobile phase : CH_3CN/H_2O = 50/50 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 300 nm

Analysis of Phthalates



No.	Analyte	No.	Analyte	No.	Analyte
1	Phthalic Acid 	2	Phthalide 	3	Benzoic Acid 

Analysis condition

Column size : 4.6 mm × 150 mm
Column temperature : 30°C
Mobile phase : $CH_3CN/85\%H_3PO_4$ in H_2O (pH2.5) = 30/70 (v/v)
Flow rate : 1.2 mL/min.
Detection : UV 254 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C18) > Wakopak Wakosil® C18 Series
https://labchem-wako.fujifilm.com/asia/category/01079.html

Wakopak Handy ODS/eco-ODS

This series consists of low-price ODS columns. By limiting the column sizes, we have reduced the price while ensuring a high number of theoretical plates (*N*) (*N* ≧ 12,000 for 4.6 mm × 150 mm; 4.6 mm × 250 mm: *N* ≧ 20,000). This series is ideal for reduce costs in routine analysis. eco-ODS features simplified packaging and is an environmentally friendly product.

Features

- ✓ The most affordable column in the Wakopak series
- ✓ High number of theoretical plates
  4.6 mm × 150 mm *N* = 12,000 or more
  4.6 mm × 250 mm*1 *N* = 20,000 or more
- ✓ Uses high-purity silica gel with low metal content, making it ideal for the separation of metal-coordinating compounds
- ✓ End-cap treatment ➡P. 5 make it ideal for the separation of basic compounds
- ✓ Improved column life due to low column pressure
- ✓ Simplified packaging for environmental friendliness*2

*1 Handy ODS only
*2 eco-ODS only

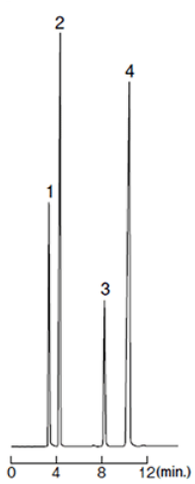
Wakopak Handy ODS

Column Information

Silica Gel	Silica Gel	**Pore Volume**	1 mL/g	**C%**	16%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of Aromatic Compounds

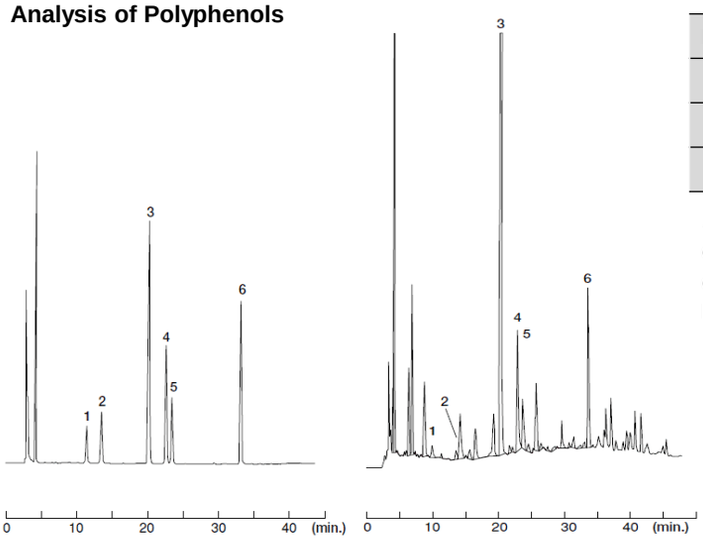


No.	Analyte	No.	Analyte
1	Pyridine	**3**	Methyl Benzoate
2	Phenol	**4**	3-Methylindole

Analysis condition

Column : Handy ODS 4.6 mm × 250 mm
Column temperature : R.T.
Mobile phase : CH_3CN/10 mM K_2HPO_4 (pH7.0) = 50/50 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Analysis of Polyphenols



Standard solution
(**1**: 100 µg/mL, **2**-**6**: 50 µg/mL)

Tea bag extract samples

No.	Analyte	No.	Analyte
1	Epigallocatechin	**4**	Epigallocatechin Gallate
2	Catechin	**5**	Epicatechin
3	Caffein	**6**	Epicatechin Gallate

Analysis condition

Column : Handy ODS 4.6 mm × 250 mm
Column temperature : 50°C
Mobile phase : A) H_2O/CH_3COOH = 100/1 (v/v)
B) CH_3CN/CH_3COOH = 100/1 (v/v)

Time (min.)	B conc. (%)
0-10	5
10-40	5-20
40-50	20
50-55	50

Flow rate : 1.0 mL/min.
Detection : UV 280 nm

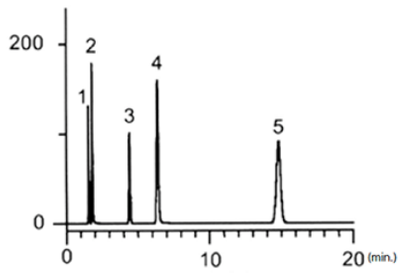
Wakopak eco-ODS

Column Information

Silica Gel	High-Purity Silica Gel	**Pore Volume**	1 mL/g	**C%**	16%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of Aromatic Compounds

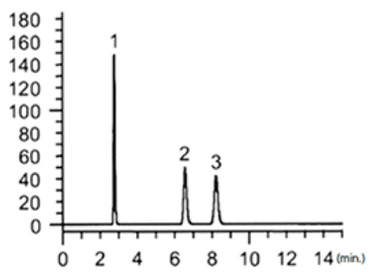


No.	Analyte	No.	Analyte	No.	Analyte
1	Uridine	3	Phenol	5	Methyl Benzoate
2	Procainamide	4	2,4,6-Trimethylpyridine		

Analysis condition

Column : eco-ODS 4.6 mm × 150 mm
Column temperature : 35°C
Mobile phase : CH_3CN/10 mM KH_2PO_4 (pH 7.0) = 30/70 (v/v)
Flow rate : 1.0 mL/min. (Press: 48 bar)
Detection : UV 254 nm

Analysis of Active Ingredients in Antipyretics

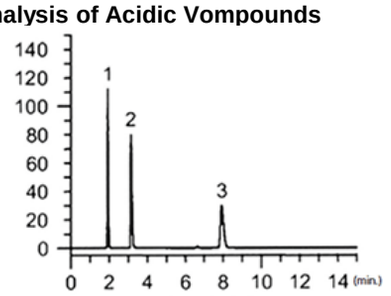


No.	Analyte	No.	Analyte	No.	Analyte
1	Acetaminophen	2	Antipyrine	3	4-Aminoantipyrine

Analysis condition

Column : eco-ODS 4.6 mm × 150 mm
Column temperature : 30°C
Mobile phase : 20 mM Phosphate buffer (pH7.0)/CH_3OH = 70/30 (v/v)
Flow rate : 1.0 mL/min. (Press: 76 bar)
Detection : UV 254 nm

Analysis of Acidic Vompounds

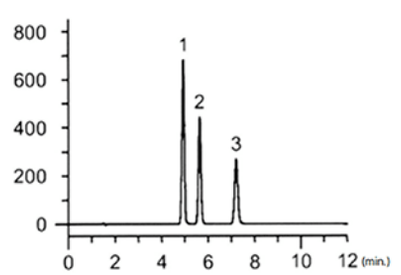


No.	Analyte	No.	Analyte	No.	Analyte
1	Tartaric Acid	2	Acetic Acid	3	Propionic Acid

Analysis condition

Column : eco-ODS 4.6 mm × 150 mm
Column temperature : 35°C
Mobile phase : 20 mM NaH_2PO_4 (pH2.5)
Flow rate : 1.0 mL/min. (Press: 44 bar)
Detection : UV 210 nm

Analysis of Food Preservatives

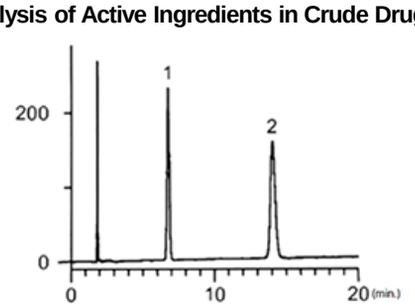


No.	Analyte	No.	Analyte	No.	Analyte
1	Benzoic Acid	2	Sorbic Acid	3	Sodium Dehydroacetate

Analysis condition

Column : eco-ODS 4.6 mm × 150 mm
Column temperature : 40°C
Mobile phase : CH_3OH/CH_3CN/5 mM Citric buffer (pH4.0) = 10/20/70 (v/v/v)
Flow rate : 1.0 mL/min. (Press: 51 bar)
Detection : UV 230 nm

Analysis of Active Ingredients in Crude Drugs



No.	Analyte	No.	Analyte
1	Scopolamine Hydrobromide	2	Atropine Sulfate

Analysis condition*1

Column : eco-ODS 4.6 mm × 150 mm
Column temperature : 25°C
Mobile phase : KH_2PO_4 + $(C_2H_5)_3N$ (pH3.5)*2/CH_3CN = 90/10 (v/v)
Flow rate : 1.0 mL/min. (Press: 58 bar)
Detection : UV 210 nm

*1 In accordance with the method for the determination of Belladonna Total Alkaloids in the Japanese Pharmacopoeia.
*2 KH_2PO_4 (6.8 g) dissolve in water (900 mL), add $(C_2H_5)_3N$ (10 mL), and adjust the pH to 3.5 with H_3PO_4, then add water (→1,000 mL).

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C18)
> Wakopak Handy ODS, Wakopak eco-ODS
https://labchem-wako.fujifilm.com/asia/category/01078.html

C22, C30

We offer a range of columns that use docosyl (C22) and triacontyl (C30) modified packing materials. Since packing materials with long alkyl chains are known to exhibit stereoselectivity not achievable with C18, they are effective for the separation and analysis of homologs and structurally related compounds.

Wakopak Navi/Wakosil®-II

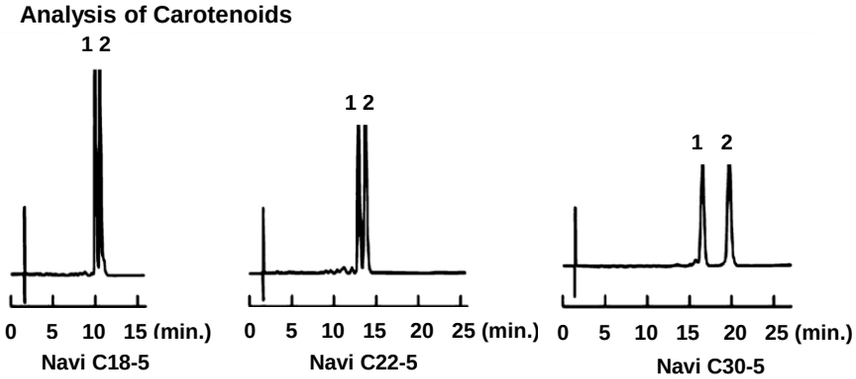
Comparison of the Wakopak Navi and Wakosil®-II Series

Wakopak	Navi C18-5 ➡P. 28	Navi C22-5 ➡P. 28	Wakosil®-II C22 ➡P. 29	Navi C30-5 ➡P. 29
Silica Gel	Ultra-High-Purity Spherical Silica Gel		High-Purity Spherical Silica Gel	Ultra-High-Purity Spherical Silica Gel
Particle Size	5 µm			
Specific Surface Area	300 m^2/g	400 m^2/g	330 m^2/g	300 m^2/g
Pore Size	12 nm			
Pore Volume	1.0 mL/g	1.2 mL/g	1.0 mL/g	
Functional Group	C18	C22		C30
Bonding Type	Monomeric			Polymeric
Endcapping ➡P. 5	✓			
C%	19%	20%		23%
USP L No.	L1	-		L62
pH Range	2.0-7.5			

Features of the Wakopak Navi Series

- ✓ Uses ultra-high-purity spherical silica gel
- ✓ High end-capped
- ✓ Allows for comparative analysis based on the different alkyl chain lengths of C18, C22, and C30

Analysis of Carotenoids

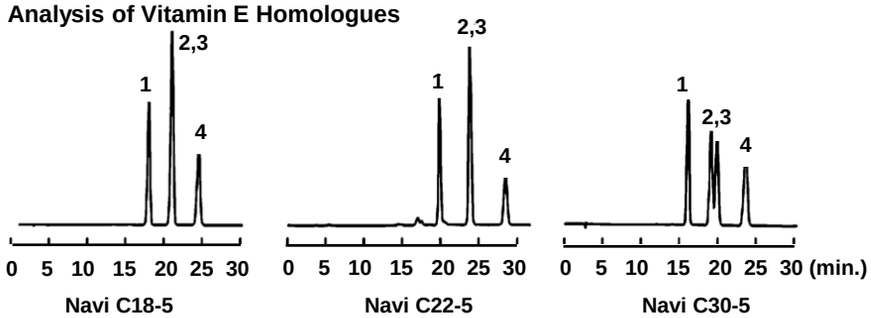


No.	Analyte	No.	Analyte
1	α-Carotene	2	β-Carotene

Analysis condition

Column size	:	4.6 mm × 250 mm
Mobile phase	:	$CH_3CN/CH_3OH/CHCl_3$ = 75/10/15 (v/v)
Flow rate	:	2.0 mL/min.
Column temperature	:	35°C
Detection	:	UV 470 nm

Analysis of Vitamin E Homologues



No.	Analyte	No.	Analyte
1	δ-Tocopherol	3	β-Tocopherol
2	γ-Tocopherol	4	α-Tocopherol

Analysis condition

Column size	:	4.6 mm × 250 mm
Mobile phase	:	CH_3CN
Flow rate	:	1.0 mL/min.
Column temperature	:	35°C
Detection	:	UV 295 nm

As the alkyl chain length increases,
the separation efficiency of homologs improves.

Wakopak Navi C18-5

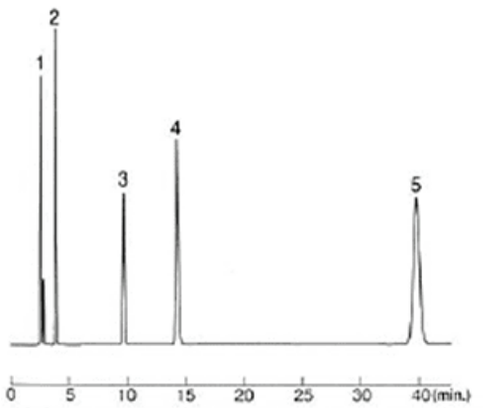
This product is the most standard performance column in the Navi series, which uses a packing material modified with octadecyl groups (C18) on ultra-high-purity spherical silica gel. It is the ideal first choice for the Navi series.

Column Information

Silica Gel	Ultra-High-Purity Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	19%
Particle Size	5 µm	**Functional Group**	Octadecyl (C18)	**USP L No.**	L1
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of Basic Compounds



No.	Analyte	No.	Analyte	No.	Analyte
1	Uridine	**3**	Phenol	**5**	Methyl Benzoate
2	Procainamide HCl	**4**	2,4,6-Trimethylpyridine		

Analysis condition

Column : Navi C18-5 4.6 mm × 250 mm
Column temperature : 35°C
Mobile phase : CH_3CN/10 mM K_2HPO_4 (pH7.0) = 30/70 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Wakopak Navi C22-5

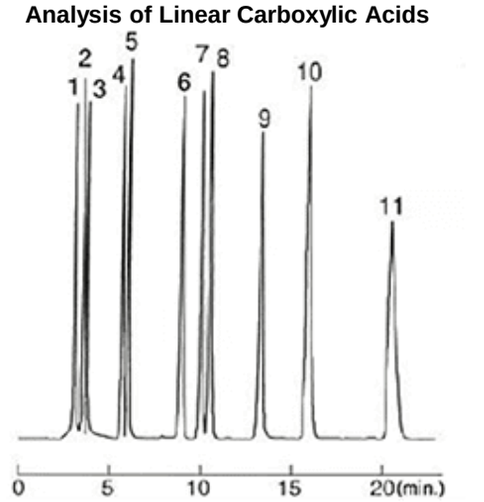
This column uses a packing material modified with docosyl groups (C22) on ultra-high-purity spherical silica gel. When used with mobile phases containing a high proportion of water, it may provide higher separation and retention performance than the Navi C18-5.

Column Information

Silica Gel	Ultra-High-Purity Spherical Silica Gel	**Pore Volume**	1.2 mL/g	**C%**	20%
Particle Size	5 µm	**Functional Group**	Docosyl (C22)	**USP L No.**	-
Specific Surface Area	400 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of Linear Carboxylic Acids



No.	Analyte	No.	Analyte	No.	Analyte	No.	Analyte
1	Oxalic Acid	**4**	Lactic Acid	**7**	Fumaric Acid	**10**	Propionic Acid
2	Tartaric Acid	**5**	Acetic Acid	**8**	Succinic Acid	**11**	Levulinic Acid
3	Formic Acid	**6**	Citric Acid	**9**	Acrylic Acid		

Analysis condition

Column : Navi C22-5 4.6 mm × 250 mm
Column temperature : 35°C
Mobile phase : 20 mM NaH_2PO_4 (pH2.5)
Flow rate : 1.0 mL/min.
Detection : UV 210 nm

Wakopak Wakosil®-II 5C22

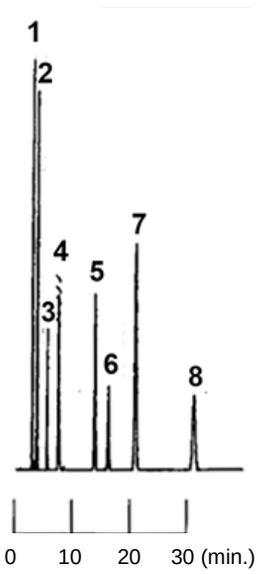
This column uses a packing material modified with docosyl groups (C22) on high-purity spherical silica gel. Compared to Navi C22-5, it has a smaller specific surface area and weaker retention capacity, so it tends to retain lower-molecular-weight compounds to decrease.

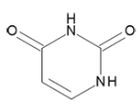
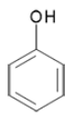
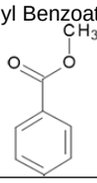
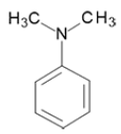
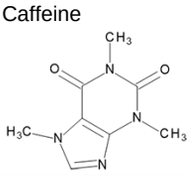
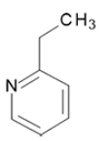
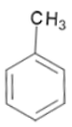
Column Information

Silica Gel	High-Purity Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	20%
Particle Size	5 µm	**Functional Group**	Docosyl (C22)	**USP L No.**	-
Specific Surface Area	330 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of 8 Aromatic Compounds



No.	Analyte	No.	Analyte	No.	Analyte	No.	Analyte
1	Uracil 	3	Phenol 	5	Methyl Benzoate 	7	*N*,*N*-Dimethylaniline 
2	Caffeine 	4	2-Ethylpyridine 	6	Benzene 	8	Toluene 

Analysis condition

Column	:	Wakosil®-II 5C22 4.6 mm × 250 mm
Column temperature	:	40°C
Mobile phase	:	CH_3CN/H_2O = 50/50 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

Wakopak Navi C30-5

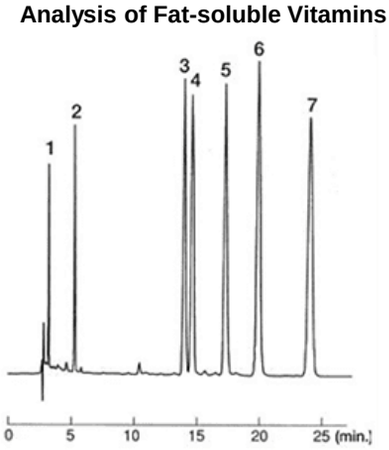
This column uses a packing material modified with triacontyl groups (C30) on ultra-high-purity spherical silica gel. The long alkyl chain length of C30 may exhibit excellent stereoselectivity for homologs and structurally related compounds.

Column Information

Silica Gel	Ultra-High-Purity Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	23%
Particle Size	5 µm	**Functional Group**	Triacontyl (C30)	**USP L No.**	L62
Specific Surface Area	300 m^2/g	**Bonding Type**	Polymeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of Fat-soluble Vitamins



No.	Analyte	No.	Analyte	No.	Analyte	No.	Analyte
1	Vitamin K_3	3	Vitamin D_2	5	Vitamin E	7	Vitamin K_1
2	Vitamin A	4	Vitamin D_3	6	Vitamin E Acetate		

Analysis condition

Column	:	Navi C30-5 4.6 mm × 250 mm
Column temperature	:	40°C
Mobile phase	:	CH_3CN/CH_3OH = 75/25 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 280 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed Phase Chromatography (C18) > Wakopak Wakosil® 5C8, 5C4, 5C4-200
https://labchem-wako.fujifilm.com/asia/category/00481.html

C1 (TMS), C4, C8

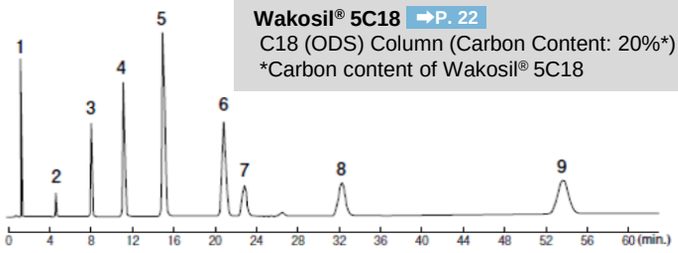
In reversed-phase chromatography, ODS columns are standard. However, in cases where you need to rapidly elute compounds with strong retention, or when you cannot increase the proportion of organic solvent in the mobile phase, columns using packing materials modified with trimethylsilyl (C1/TMS), butyl (C4), or octyl (C8) - which have lower carbon content and shorter alkyl chain lengths than ODS columns - may be more effective. We provide range of columns that use TMS, C4, and C8-modified packing materials to meet these needs.

Comparison of Elution Times for Aromatic Compounds on C1, C4, C8, and C18 Columns

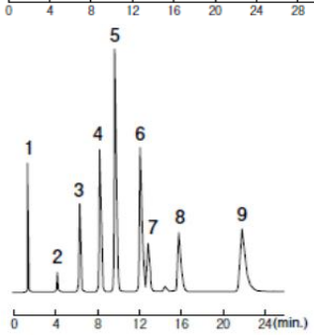
Long

Elution Time

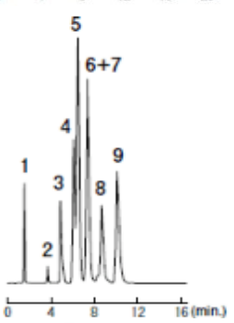
Short



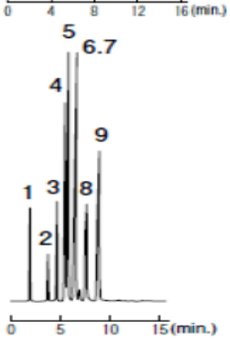
Wakosil® 5C18 ➡P. 22
C18 (ODS) Column (Carbon Content: 20%*)
*Carbon content of Wakosil® 5C18



Wakosil® 5C8 ➡P. 32
C8 column (carbon content: 12%*)
*Carbon content of Wakosil® 5C8



Wakosil® 5C4 ➡P. 32
C4 column (carbon content: 8%*)
*Carbon content of Wakosil® 5C4



Wakosil® 5TMS ➡P. 30
TMS column (carbon content: 4%)

No.	Analyte	No.	Analyte
1	Uracil	6	Fluoranthene
2	Benzene	7	Pyrene
3	Naphthalene	8	Chrysene
4	Biphenyl	9	Benzo[*a*]pyrene
5	Phenanthrene		

Analysis condition

Column size	:	4.6 mm × 150 mm
Column temperature	:	25°C
Mobile phase	:	CH_3CN/H_2O = 60/40 (v/v)
Flow rate	:	5C18 : 1.0 mL/min. 5C8 : 1.0 mL/min. 5C4 : 1.0 mL/min. 5TMS: 0.9 mL/min.
Detection	:	UV 254 nm

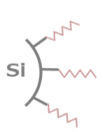
Wakopak Wakosil® 5TMS

This is a column that uses a packing material modified with trimethylsilyl groups (TMS) on spherical silica gel. It exhibits lower retention capacity of hydrophobic compounds compared to columns using butyl (C4)-modified packing material. It is effective when strong retention compound is present and rapid elution is desired, or when the proportion of organic solvent in the mobile phase cannot be increased. Furthermore, since it can be used with samples across a wide polarity range, it is also employed in applications such as the compositional analysis of Liposomes[1)].

1) Shimizu, Y. *et al.*: *J. of Chromatog. B,* **754**, 127 (2000).

Features

- ✓ Compared to ODS columns, these columns have a lower carbon content and lower hydrophobicity, which shortens the elution time of hydrophobic compounds in reversed-phase systems
- ✓ Can be used with aqueous mobile phases, making it suitable for samples with a wide range of polarities



ODS
(Carbon content: approx. **20**%)

TMS
(Carbon content: approx. **4**%)

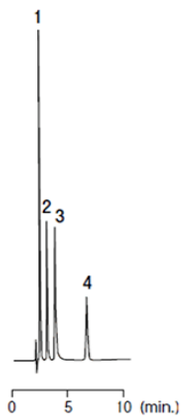
Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1.0 mL/g	**C%**	4%
Particle Size	5 µm	**Functional Group**	Trimethylsilyl (TMS)	**USP L No.**	L13
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Analysis Example

Analysis of Aromatic Compounds ➡P. 30

Analysis of Water-soluble Vitamins



No.	Analyte	No.	Analyte
1	L(+)-Ascorbic Acid (V. C)	3	Pyridoxine Hydrochloride (V. B_6)
2	Thiamine Hydrochloride (V. B_1)	4	Nicotinic Acid Amide

Analysis condition

Column : Wakosil® 5TMS 4.6 mm × 150 mm
Column temperature : R.T.
Mobile phase : CH_3OH/0.15 mM KH_2PO_4 = 5/95 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C18) > Wakopak Wakosil® 5TMS
https://labchem-wako.fujifilm.com/asia/category/01235.html

Wakopak Wakosil®/Wakosil®-II (C4/C8)

This series is a standard column within the Wakopak series, which uses a packing material based on spherical silica gel. Wakosil®-II series offers performance characteristics such as a high number of theoretical plates and compatibility with aqueous mobile phases. To support analytical validation, Wakosil®-II series guarantees the “physical properties of the silica gel substrate” and the “properties of packing materials after chemical modification,” tailored to the characteristics of each series.

Comparison of the Wakosil® and Wakosil®-II Series

Wakopak	Wakosil®		Wakosil®-II		
	- ➡P. 32	C4-200 C18-200 ➡P. 32	HG ➡P. 33	RS ➡P. 34	C8-100 HG ➡P. 33
Features	Standard performance	Small specific surface area	High number of theoretical plates	High separation efficiency in aqueous mobile phases	High number of theoretical plates/High retention capacity
Applications	General analysis	Rapid analysis	First choice	Analysis of compounds with a wide polarity range	Analysis of high polarity compounds
Functional Group	C4, C8, C18	C4, C18	C8, C18	C8, 18	C8
Particle Size (µm)	C4 : 5 C8 : 5 C18: 5, 7, 10	C4: 5 C18: 5, 10	C8: 5 C18: 3, 5	3, 5	3
Bonding Type	Monomeric	Monomeric	Monomeric	Monomeric	

Features of the Wakosil® Series ➡P. 21

- ✓ The use of a packing material based on fully spherical silica gel provides higher reproducibility compared to crushed silica gel
- ✓ Available with three levels of end-cap type ➡P. 5 : high-end-capped, end-capped, and non-end-capped

Features of the Wakosil®-II Series ➡P. 14

- ✓ Uses **high-purity silica gel** with low metal content
- ✓ A lineup of **series with unique features** (AR, HG, RS)
- ✓ Guarantees the **“physical properties of the silica gel substrate”** and the **“properties of packing materials after chemical modification,”** tailored to the characteristics of each series.

Specification of Wakopak Wakosil®-II Series
(physical properties of the silica gel substrate, properties of packing materials after chemical modification)

Wakopak		Wakosil®-II HG	Wakosil®-II RS	
Particle Size (μm)		5	3	5
Particle Size Distribution (Silica Gel Substrate)	d50 (μm)	4.2-4.7	3.0-3.7	4.2-4.7
	d10 (μm)	d10≧d50-1.5	d10≧d50-1.5	d10≧d50-1.5
	d90 (μm)	d90≧d50+1.5	d90≧d50+1.5	d90≧d50+1.5
Pore Size (Silica Gel Substrate) (nm)		11.0-13.0	9.5-11.5	11.0-13.0
Specific Surface Area (Silica Gel Substrate) (m^2/g)		280-320	390-430	390-430
Pore Volume (Silica Gel Substrate) (mL/g)		0.85-1.00	0.95-1.10	1.15-1.30
C (%)		9.0-11.0	9.0-11.5	16.0-18.5
Number of theoretical plates (Naphthalene)		≧22,000	≧14,000	≧21,500
Capacity Factor (Naphthalene)		3.2-4.1	2.7-3.3	3.7-4.4
Separation Factor	Naphthalene/Benzene	2.0-2.1	1.6-1.8	1.9-2.1
	Phenol/Pyridine	-	≧2.6	≧2.8
Symmetry Factor (10% height)	Naphthalene	1.0-1.4	1.0-1.4	1.0-1.4
	Procainamide	2.0-4.0	1.2-2.4	1.6-2.8
	2,4,6-Trimethylpyridine	1.5-3.0	1.0-2.0	1.0-2.0
Tailing Factor (10% height)	Naphthalene	0.9-1.3	0.9-1.3	0.9-1.3
	Oxine-Cu	1.5-4.0	1.0-3.0	1.0-3.0
Retention Time (min.)	Dopamine	-	-	7.0-8.5
	DOPA	-	-	7.0-8.5
Functional Group		C8	C8	C8
USP L No.		L7	L7	L7

Wakopak Wakosil® C4/C8/C18

This is the most standard series within the Wakopak.

Column Information ➡P. 22

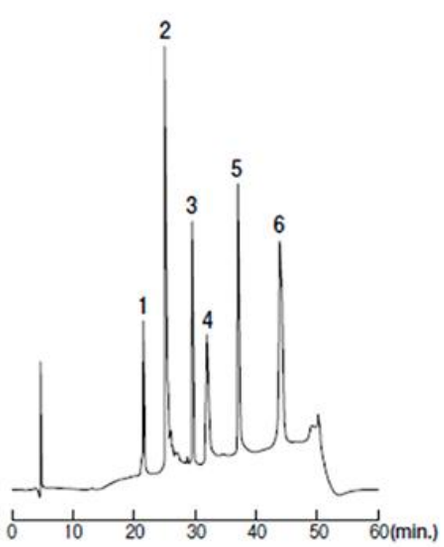
Wakopak Wakosil® C4-200/C18-200

Because this column has a small specific surface area and weak retention, retention time is shortened, enabling rapid analysis. Its separation efficiency is nearly equivalent to that of the Wakosil® C4/C18 types. Wakosil® 5C4-200 demonstrates high recovery rates in the analysis and preparative separation of proteins with molecular weights ranging from tens of thousands to 100,000.

Column Information ➡P. 22

Analysis Example

Analysis of Proteins



No.	Analyte	No.	Analyte
1	Ribonuclease (M.W. 14,000)	4	BSA (M.W. 60,000)
2	Insulin (M.W. 6,000)	5	Myoglobin (M.W. 18,500)
3	Lysozyme (M.W. 14,400)	6	Ovalbumin (M.W. 45,000)

Analysis condition

Column : Wakosil® 5C4-200 4.6 mm × 150 mm

Column temperature : R.T.

Mobile phase : A) CH_3CN/0.1% TFA = 20/80 (v/v) B) CH_3CN/0.1% TFA = 60/40 (v/v)

Time (min.)	B conc. (%)
0-20	0-100
20-60	100

Flow rate : 1.0 mL/min.

Detection : UV 220 nm

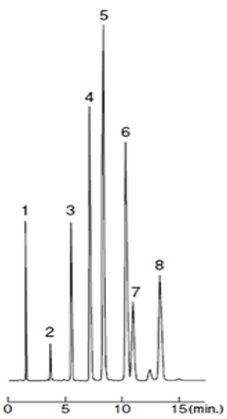
Wakopak Wakosil®-II HG

This product has the highest number of theoretical plates (approximately 15,000 plates for a column size of 4.6 mm × 150 mm) among our column products.

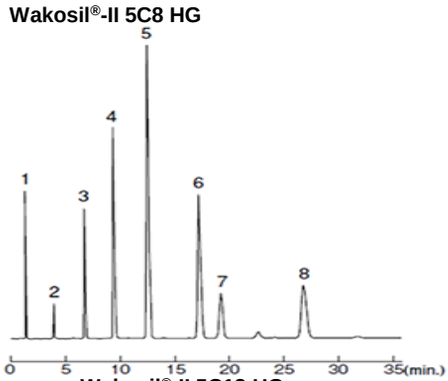
Column Information ➡P. 15

Analysis Example

Analysis of Aromatic Compounds



Wakosil®-II 5C8 HG



Wakosil®-II 5C18 HG

No.	Analyte	No.	Analyte
1	Uracil	5	Phenanthrene
2	Benzene	6	Fluoranthene
3	Naphthalene	7	Pyrene
4	Biphenyl	8	Chrysene

Analysis condition

Column size	:	4.6 mm × 150 mm
Column temperature	:	35°C
Mobile phase	:	CH_3CN/H_2O (v/v) = 60/40 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

Wakopak Wakosil®-II 3C8-100 HG

This product has the highest number of theoretical plates (approximately 15,000 plates for a column size of 4.6 mm × 150 mm) among our column products. Due to its small pore size of 10 nm, this product exhibits a large specific surface area and high retention capacity.

Column Information

Silica Gel	High-purity silica gel with low metal content	**Pore Volume**	1 mL/g	**C%**	10 %
Particle Size	3 µm	**Functional Group**	Octyl (C8)	**USP L No.**	L7
Specific Surface Area	350 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	10 nm	**Endcapping**	✓		

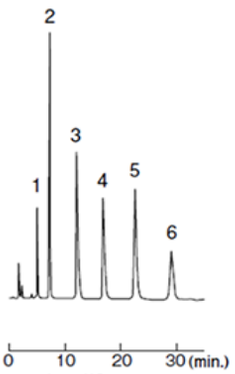
Wakopak Wakosil®-II RS

This product has undergone thorough end-cap treatment ➡P. 5 and can be used even with water-based mobile phases. As a result, mixed samples with a wide range of polarities and basic compounds can be analyzed without tailing. It also has a large specific surface area and exhibits high retention capacity.

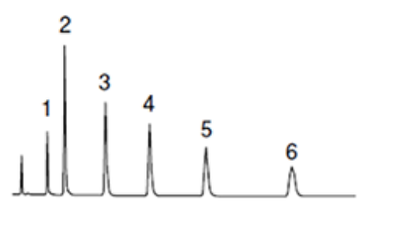
Column Information ➡P. 16

Analysis Example

Analysis of Tricyclic Antidepressants



Wakosil®-II 5C8 RS



Wakosil®-II 5C18 RS

No.	Analyte	No.	Analyte
1	Protriptyline Hydrochloride	4	Imipramine Hydrochloride
2	Nortriptyline Hydrochloride	5	Amitriptyline Hydrochloride
3	Doxepin Hydrochloride	6	Trimipramine Maleate

Analysis condition

Column size : 4.6 mm × 150 mm
Column temperature : 40°C
Mobile phase : CH_3OH/20 mM KH_2PO_4, K_2HPO_4 (pH6.5) = 62/38 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Analysis of Water-soluble Vitamins ➡P. 16

Analysis of Anionic Surfactants (LAS) ➡P. 49

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C1 (TMS), C4, C8) > Wakopak Wakosil® 5C8, 5C4, 5C4-200
https://labchem-wako.fujifilm.com/asia/category/01234.html

Ph, Fluorinated Silicone (Fluofix®)

ODS columns are common in reversed-phase chromatography, but depending on the compound, other chemically modified packing materials can provide better separation. For instance, phenyl-modified silica columns (Ph) suit aromatic compounds, while fluorinated-silicone-modified silica columns (F) are ideal for halogenated compounds. We offer a full line of columns featuring Ph and fluorinated-silicone-modified packing materials.

Wakopak Wakosil® 5Ph

This column uses spherical silica gel modified with phenyl groups and, like TMS-modified columns, it can be used with samples that have a wide range of polarities. The phenyl groups enable π-π and CH-π interactions, offering different separation profiles from ODS columns for compounds with aromatic rings or double bonds.

Features

- ✓ Compared to ODS columns, this column have a lower carbon content and lower hydrophobicity, resulting in shorter retention times
- ✓ Because they are modified with phenyl groups, they exhibit specific separation of aromatic compounds

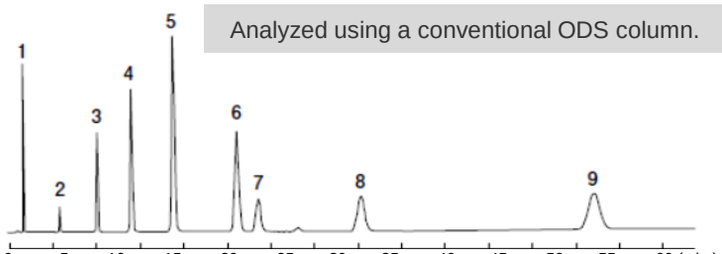
Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	9%
Particle Size	5 µm	**Functional Group**	Phenyl (Ph)	**USP L No.**	L11
Specific Surface Area	300 m^2/g	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Application Example

Analysis of Neutral Compounds

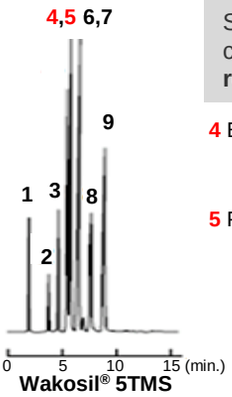
Analyzed using a conventional ODS column.



Wakosil® 5C18

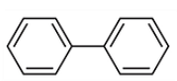
No.	Analyte	No.	Analyte
1	Uracil	6	Fluoranthene
2	Benzene	7	Pyrene
3	Naphthalene	8	Chrysene
4	Biphenyl	9	Benzo[*a*]pyrene
5	Phenanthrene		

Switched to a TMS column with a lower carbon content and lower hydrophobicity, **reducing elution time.**

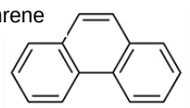


Wakosil® 5TMS

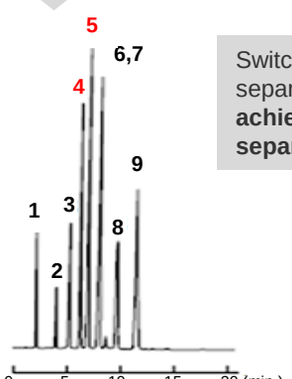
4 Biphenyl



5 Phenanthrene



Switched to a Ph column with specific separation for aromatic compounds, **achieving fast and high-resolution separation of 4 and 5.**



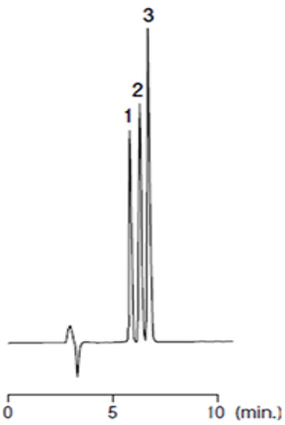
Wakosil® 5Ph

Analysis condition

Column size	:	4.6 mm × 150 mm
Column temperature	:	25°C
Mobile phase	:	CH_3CN/H_2O = 60/40 (v/v)
Flow rate	:	5C18 : 1.0 mL/min. 5TMS: 0.9 mL/min. 5Ph : 0.9 mL/min.
Detection	:	UV 254 nm

Analysis Example

Analysis of *o*,*m*,*p*-Nitroaniline



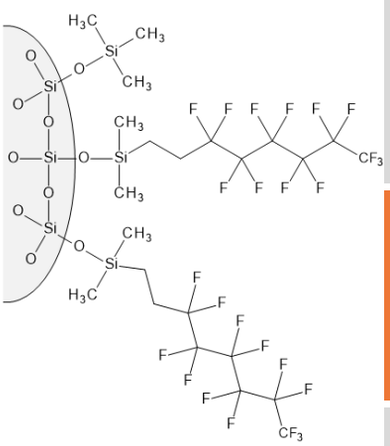
No.	Analyte	No.	Analyte	No.	Analyte
1	*o*-Nitroaniline	2	*m*-Nitroaniline	3	*p*-Nitroaniline

Analysis condition

Column	:	Wakosil® 5Ph 4.6 mm × 250 mm
Column temperature	:	R.T.
Mobile phase	:	$CH_3CN/H_2O/CH_3COOH$ = 45/54/1 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C18) > Wakopak Wakosil® 5Ph
https://labchem-wako.fujifilm.com/asia/category/01236.html

Wakopak Fluofix®-II 120E



This product is a column that uses a packing material consisting of spherical silica gel modified with fluorinated silicone. Like standard ODS columns, it is used in reversed-phase mode; however, due to the strong water- and oil-repellent properties and rigid structure of the fluorinated silicone, it exhibits specific separation behavior depending on the compound. Furthermore, its specific recognition of halogen atoms may make it suitable for the separation of halogenated compounds.

Features

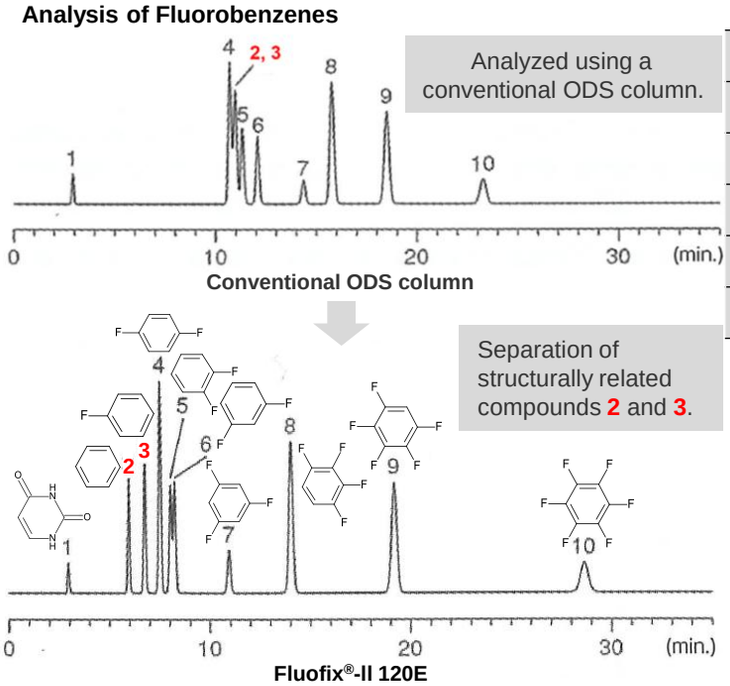
- ✓ The rigid structure distinguishes stereochemical differences, strongly retaining more complex stereoisomers, enabling separation of compounds with slight positional variations (*o*, *m*, *p*).
- ✓ Fluorinated silicone's water- and oil-repellent properties sharpen peaks by reducing broadening from excessive retention on ODS columns.
- ✓ Strongly retains compounds containing halogen atoms (particularly fluorine); retention strength increases as the number of halogen atoms in the compound increases.

Column Information

Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**C%**	9.5%
Particle Size	5 µm	**Functional Group**	Fluorinated silicone (F)	**USP L No.**	L##
Specific Surface Area	300 m^2/g	**Bonding Type**	-	**pH Range**	2.0-7.5
Pore Size	12 nm	**Endcapping**	✓		

Application Example

Analysis of Fluorobenzenes



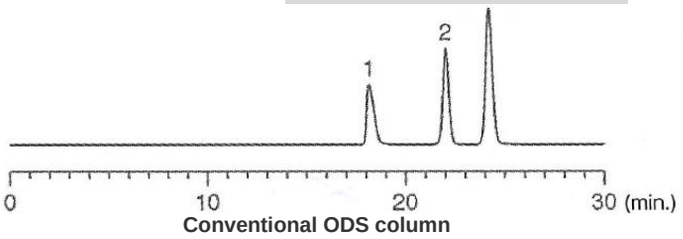
No.	Analyte	No.	Analyte
1	Uracil	6	*m*-Difluorobenzene
2	Benzene	7	1,3,5-Trifluorobenzene
3	Fluorobenzene	8	1,2,3,4-Tetrafluorobenzene
4	*p*-Difluorobenzene	9	Pentafluorobenzene
5	*o*-Difluorobenzene	10	Hexafluorobenzene

Analysis condition

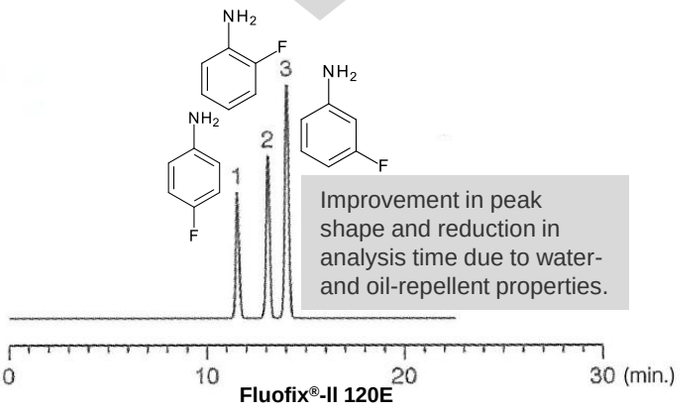
Column size	:	4.6 mm × 250 mm
Column temperature	:	40°C
Mobile phase	:	CH_3OH/H_2O = 60/40 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

Analysis of Fluoroanilines

Analyzed using a conventional ODS column.



Conventional ODS column



Improvement in peak shape and reduction in analysis time due to water- and oil-repellent properties.

Fluofix®-II 120E

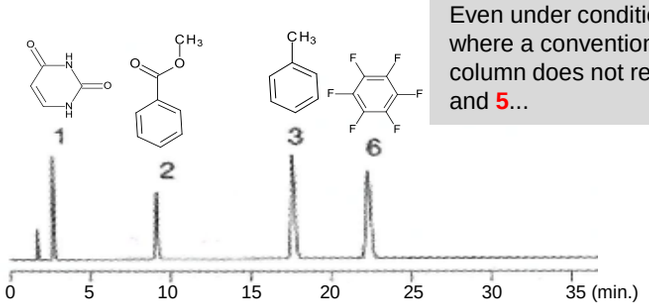
No.	Analyte	No.	Analyte	No.	Analyte
1	*p*-Fluoroaniline	2	*o*-Fluoroaniline	3	*m*-Fluoroaniline

Analysis condition

Column size	:	4.6 mm × 250 mm
Column temperature	:	40°C
Mobile phase	:	CH_3OH/20 mmol/L Tetrabutylammonium Bromide = 20/80 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

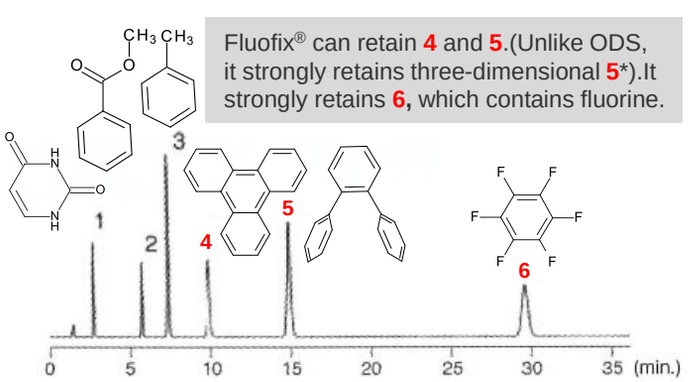
Analysis of aromatic compounds

Even under conditions where a conventional ODS column does not retain **4** and **5**...



Conventional ODS column

Fluofix® can retain **4** and **5**.(Unlike ODS, it strongly retains three-dimensional **5***).It strongly retains **6**, which contains fluorine.



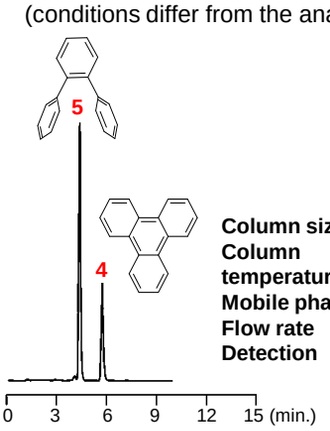
Fluofix®-II 120E

No.	Analyte	No.	Analyte
1	Uracil	4	Triphenylene
2	Methyl Benzoate	5	*o*-Terphenyl
3	Toluene	6	Hexafluorobenzene

Analysis condition

Column size	:	4.6 mm × 250 mm
Column temperature	:	40°C
Mobile phase	:	CH_3OH/H_2O = 60/40 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

***Example of analysis of 4 and 5 on an ODS column**
(conditions differ from the analysis example above.)



Column size	:	4.6 mm × 250 mm
Column temperature	:	40°C
Mobile phase	:	CH_3OH/H_2O = 90/10 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Reversed-Phase Chromatography (C18) > Wakopak Fluofix®-II 120E
https://labchem-wako.fujifilm.com/asia/category/00485.html

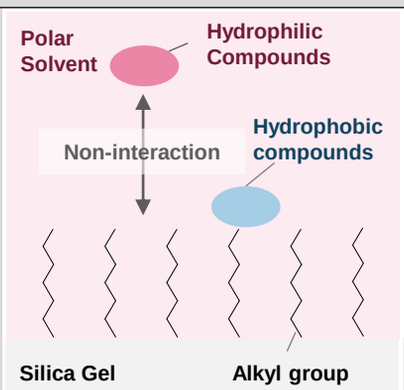
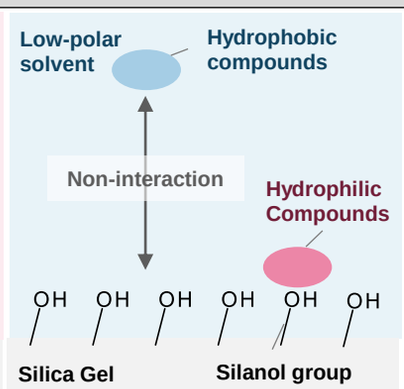
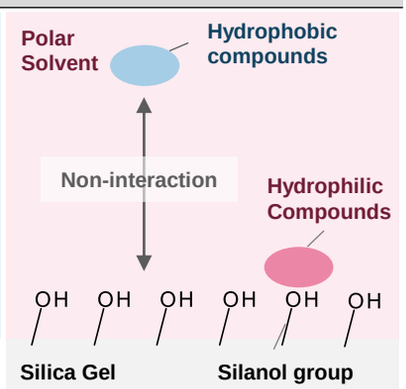
Normal-Phase (CN, NH_2, SIL, SIL (HILIC))

In liquid chromatography, if the stationary phase is less polar than the mobile phase, it is called reversed-phase chromatography. If the stationary phase is more polar, it is normal-phase chromatography. When both phases are highly polar, it is hydrophilic interaction chromatography (HILIC). Normal-phase and HILIC use columns packed with silica gel (SIL) or silica gel modified with polar groups like aminopropyl (NH_2) or cyanopropyl (CN). We offer SIL, CN, and NH_2 columns that can be used in both normal-phase and HILIC modes.

Comparison of Wakopak Wakosil® and Wakosil®-II (SIL, SIL-AQ, CN, NH_2)

Wakopak	Wakosil® SIL ➡P. 40	Wakosil® SIL-120 ➡P. 40	Wakosil®-II 5SIL-AQ ➡P. 42	Wakosil®/ Wakosil®-II 5CN ➡P. 43	Wakosil® $5NH_2$ ➡P. 44
Functional Group	- (Unmodified/OH)	- (Unmodified/OH)	- (Unmodified/OH)	Cyanopropyl (CN)	Aminopropyl (NH_2)
Separation Mode	Normal phase	Normal phase	HILIC	Reversed-phase/ Normal-phase	Reversed-phase/ Normal-phase
Particle Size (µm)	5, 10	5, 7	5	5	5
Features	Standard performance	Small specific surface area	Analyzes polar compounds under reversed-phase conditions in possible without ion-pair reagents.	-Normal-/reversed-phase compatibility -CN-derived π interactions -Hydrogen-bonding interactions via nitrogen lone pairs	-Normal-/reversed-phase compatibility -NH_2-derived ion-exchange capability
Applications	Analysis of polarity compounds	Rapid analysis of polarity compounds	Analysis of polar compounds under reversed-phase conditions	-Analysis of mixed samples with large differences in polarity -Analysis of aromatic compounds	Analysis of sugars and nucleotides
Preparative Column (Prep Series) ➡P. 18	✓	-	-	-	-

Differences between Normal-Phase, Reversed-Phase, and HILIC Chromatography ➡P. 5

	Reversed-phase Chromatography	Normal-phase Chromatography	HILIC
			
Functional Group	Low polarity (C4-C30, Ph, TMS)	High polarity (- (Unmodified/OH)), NH_2, CN)	High polarity (- (Unmodified/OH))
Mobile Phase	High polarity (Water, Methanol, Acetonitrile)	Low polarity (Hexane, Toluene, Chloroform)	High polarity (Acetonitrile, Methanol, Water (5-30%))
Retained Compounds	Low polarity	High polarity	High polarity
Interactions	Hydrophobic interactions	Hydrophilic interactions	Hydrophilic partition interactions

Wakopak Wakosil® SIL

Wakopak Wakosil® SIL

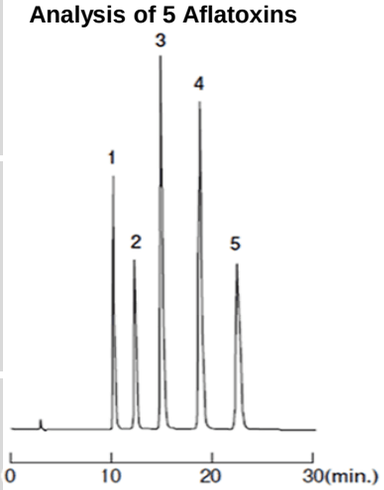
This column is a standard normal phase column using unmodified silica gel.

Column Information

Silica Gel	Spherical Silica Gel	**Functional Group**	- (Unmodified/OH)	**USP L No.**	L3
Particle Size	5 µm, 10 µm	**Bonding Type**	-	**pH Range**	1.5-7.5
Specific Surface Area	500 m^2/g	**Endcapping**	-	**Preparative Column (Prep Series)**	5SIL : ✓
Pore Size	6 nm	**C%**	-	➡P. 18	10SIL: -
Pore Volume	0.8 mL/g				

Analysis Example

Analysis of 5 Aflatoxins



No.	Analyte	No.	Analyte
1	Aflatoxin B_1	4	Aflatoxin G_2
2	Aflatoxin B_2	5	Aflatoxin M_1
3	Aflatoxin G_1		

Analysis condition

Column : Wakosil® 5SIL 4.6 mm × 250 mm
Column temperature : R.T.
Mobile phase : Toluene/Ethyl Acetate/HCOOH/CH_3OH = 50/5/1/2 (v/v/v/v)
Flow rate : 1.0 mL/min.
Detection : FL λ_{ex} 365 nm, λ_{em} 425 nm

Analysis of Vitamin E Homologues ➡P. 41 (below)

Wakopak Wakosil® SIL-120

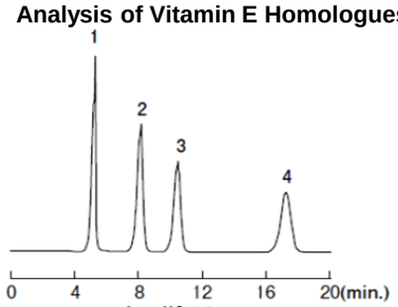
This product is a normal-phase column using unmodified silica gel. Since it has a smaller specific surface area and weaker retention than Wakosil® SIL, retention times are shortened, enabling rapid analysis.

Column Information

Silica Gel	Spherical Silica Gel	**Functional Group**	-(Unmodified/OH)	**USP L No.**	L3
Particle Size	5 µm, 7 µm	**Bonding Type**	-	**pH Range**	1.5-7.5
Specific Surface Area	300 m^2/g	**Endcapping**	-	**Preparative Column(Prep Series)**	-
Pore Size	12 nm	**C%**	-	➡P. 18	

Analysis Example

Analysis of Vitamin E Homologues



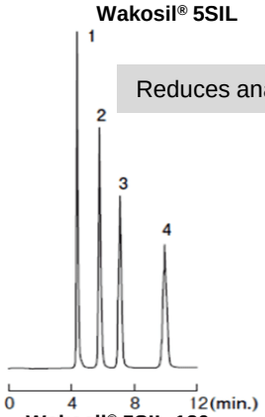
Wakosil® 5SIL

No.	Analyte	No.	Analyte
1	α-Tocopherol	3	γ-Tocopherol
2	β-Tocopherol	4	δ-Tocopherol

Analysis condition

Column size	:	4.6 mm × 150 mm
Column temperature	:	R.T.
Mobile phase	:	*n*-Hexane/Diisopropyl Ether = 90/10 (v/v)
Flow rate	:	2.0 mL/min.
Detection	:	UV 295 nm

Reduces analysis time



Wakosil® 5SIL-120

Wakopak Wakosil®-II 5SIL Prep

This product is a standard normal-phase preparative column that uses unmodified silica gel. It utilizes high-purity silica gel with low metal content, making it ideal for the preparation of compounds that are sensitive to metal impurities.
Please refer to ➡P. 18 , for information on how to set preparative conditions.

Column Information

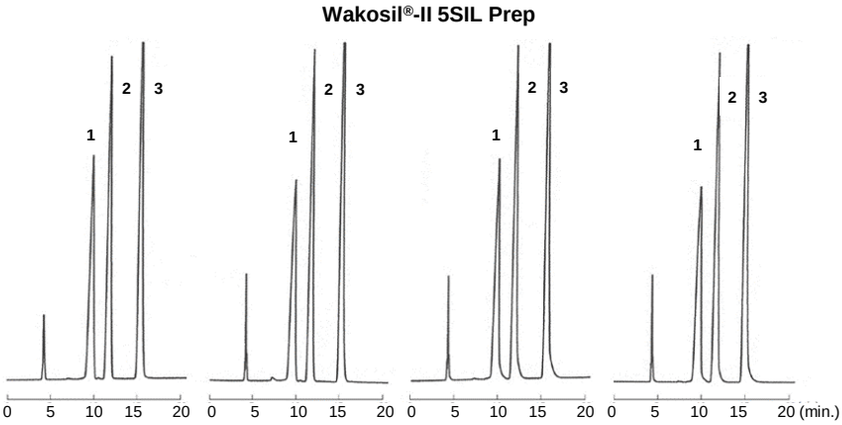
Silica Gel	High-purity silica gel with low metal content	**Pore Volume**	1 mL/g	**C%**	-
Particle Size	5 µm	**Functional Group**	-	**USP L No.**	L3
Specific Surface Area	300 m²/g	**Bonding Type**	-	**Inner Diameter**	4.6, 20, 50 mm
Pore Size	12 nm	**Endcapping**	-	**pH Range**	1.5-7.5

Examples of Preparative Applications

Preparative Separation of Benzoic Acid Esters

No.	Analyte
1	Hexyl Benzoate
2	Propyl Benzoate
3	Methyl Benzoate

Wakosil®-II 5SIL Prep



Analysis condition

Column size	:	4.6 mm × 250 mm	20 mm × 250 mm	33 mm × 250 mm	50 mm × 250 mm
Flow rate	:	1.0 mL/min.	18.9 mL/min.	51.5 mL/min.	115.8 mL/min.
Column pressure	:	18 kg/cm²	18 kg/cm²	16 kg/cm²	14 kg/cm²
Injection volume		10 µL	190 µL	500 µL	1.15 mL
Column temperature	:	R.T.			
Mobile phase	:	*n*-Hexane/Ethyl Acetate=100/0.5 (v/v)			
Detection	:	UV 254 nm			

Wakopak Wakosil®-II 5SIL-AQ

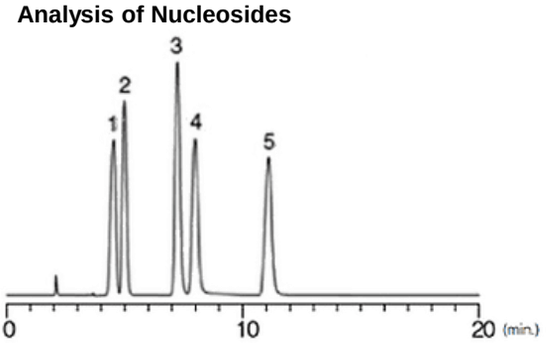
This product is a column for hydrophilic interaction chromatography (HILIC) using unmodified silica gel. In HILIC, highly polar target compounds are separated using highly polar mobile phases such as water, methanol, acetonitrile, and other highly polar mobile phases. Since mobile phases containing water can be used, this column is effective for separating highly polar compounds under the same conditions as reversed-phase mode. Additionally, it allows for the establishment of analytical conditions without the use of ion-pair reagents, enabling a smooth transition to LC/MS analysis.

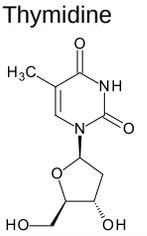
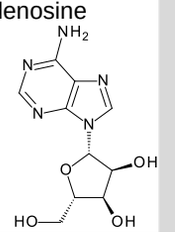
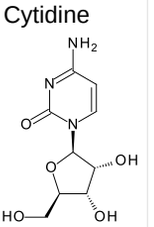
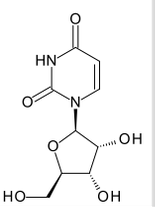
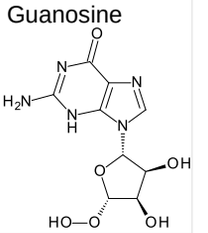
Column Information

Silica Gel	High-purity Silica Gel	**Functional Group**	- (Unmodified/OH)	**USP L No.**	L3
Particle Size	5 µm	**Bonding Type**	-	**pH Range**	1.5-7.5
Specific Surface Area	500 m^2/g	**Endcapping**	-	**Preparative Column (Prep Series)**	-
Pore Size	6 nm	**C%**	-	➡P. 18	
Pore Volume	0.8 mL/g				

Analysis Example

Analysis of Nucleosides

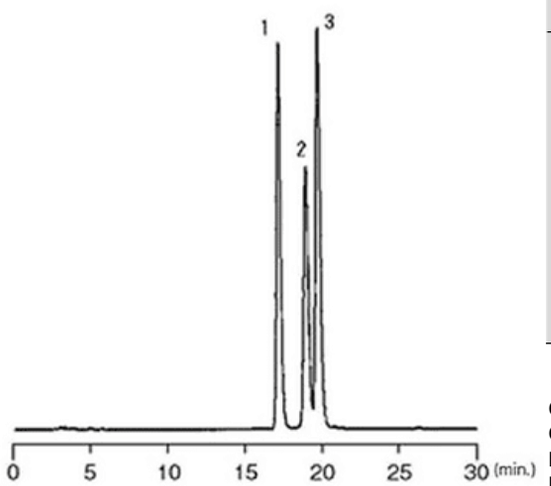


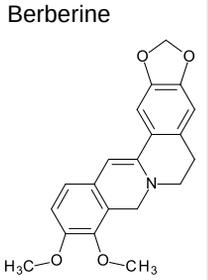
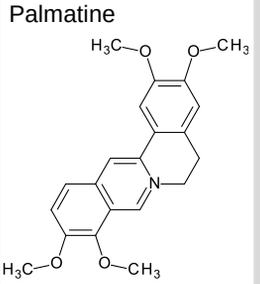
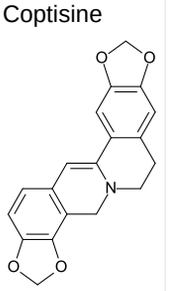
No.	Analyte	No.	Analyte	No.	Analyte
1	Thymidine 	3	Adenosine 	5	Cytidine 
2	Uridine 	4	Guanosine 		

Analysis condition

Column : Wakosil®-II 5SIL-AQ 4.6 mm × 250 mm
Colum temperature : 40°C
Mobile phase : CH_3CN/0.1 M $HCOONH_4$ (pH 3.0) = 85/15 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 260 nm

Analysis of Crude Drug Ingredients



No.	Analyte	No.	Analyte	No.	Analyte
1	Berberine 	2	Palmatine 	3	Coptisine 

Analysis condition

Column : Wakosil®-II 5SIL-AQ 4.6 mm × 250 mm
Column temperature : 40°C
Mobile phase : CH_3CN/0.1 M $HCOONH_4$ (pH 3.0) = 95/5 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 345 nm

Wakopak Wakosil®/Wakosil®-II 5CN

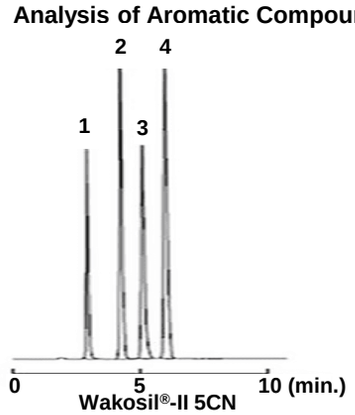
This column uses silica gel modified with cyano propyl groups (CN), usable in normal-phase mode with low-polarity mobile phases or reversed-phase mode with high-polarity mobile phases. Reversed-phase mode suits compounds insoluble in organic solvents or too hydrophobic for ODS columns. In addition, this column may exhibit specific separation of aromatic compounds and other substances due to π-electron interactions resulting from the triple bond of the cyano group and hydrogen bonding with the non-bonding electron pair localized on the nitrogen atom. In addition, compared to standard ODS columns, these columns have a lower carbon content, which enables shorter analysis times for low-polarity compounds in reversed-phase mode. To suppress the tailing of basic compounds, we offer both an end-capped ➡P. 5 type (Wakosil® 5CN), in which the residual silanol groups on the silica gel have been end-capped, and a non-end-capped type (Wakosil®-II 5CN).

Column Information

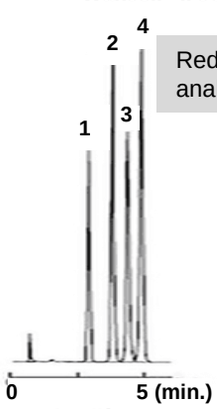
Silica Gel	Spherical Silica Gel	**Pore Volume**	1 mL/g	**USP L No.**	L10
Particle Size	5 μm	**Functional Group**	Cyanopropyl (CN)	**pH Range**	2.0-7.5
Specific Surface Area	Wakosil® : 300 m^2/g	**Bonding Type**	Monomeric	**Preparative Column (Prep Series)** ➡P. 18	-
	Wakosil®-II: 360 m^2/g	**Endcapping**	Wakosil® : -		
Pore Size	Wakosil® : 12 nm		Wakosil®-II: ✓		
	Wakosil®-II: 11 nm	**C%**	7%		

Analysis Example

Analysis of Aromatic Compounds



Wakosil®-II 5CN



Reduces analysis time

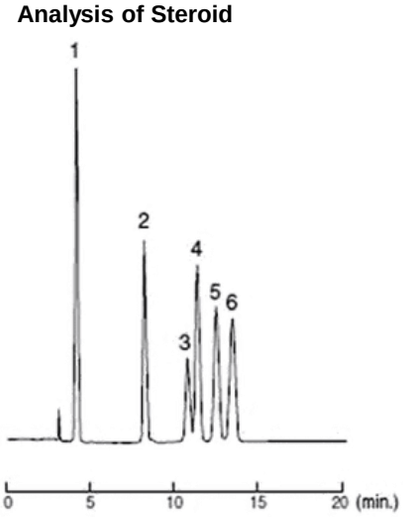
Wakosil® 5CN

No.	Analyte	No.	Analyte
1	Benzyl Alcohol	3	*p*-Tolualdehyde
2	Acetophenone	4	Anisole

Analysis condition

Column size : 4.6 mm × 150 mm
Column temperature : R.T.
Mobile phase : CH_3CN/H_2O=35/65 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Analysis of Steroid



No.	Analyte	No.	Analyte
1	Deoxycorticosterone Acetate	4	Prednisone
2	Cortisone Acetate	5	Hydrocortisone
3	Cortisone	6	Prednisolone

Analysis condition

Column : Wakosil® 5CN 4.6 mm × 250 mm
Column temperature : R.T.
Mobile phase : Isooctane/CH_2Cl_2/CH_3OH = 80/16/4 (v/v/v)
Flow rate : 1.5 mL/min.
Detection : UV 254 nm

Wakopak Wakosil® $5NH_2$

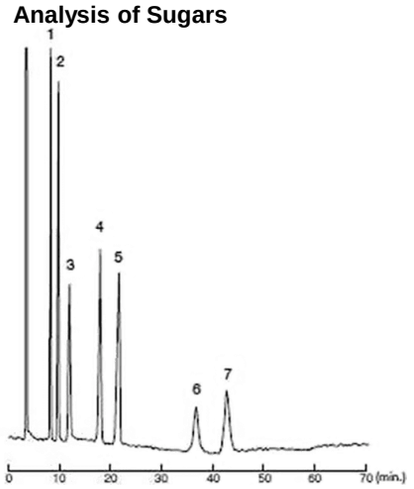
This column uses silica gel modified with aminopropyl groups (NH_2), which can be used in normal-phase mode with low-polarity mobile phases and in reversed-phase mode with high-polarity mobile phases. Its ion-exchange capacity derived from the NH_2 groups makes it useful for the analysis of sugars and nucleosides.

Column Information

Silica Gel	Spherical Silica Gel	**Functional Group**	Aminopropyl (NH_2)	**USP L No.**	L8
Particle Size	5 µm	**Bonding Type**	Monomeric	**pH Range**	2.0-7.5
Specific Surface Area	300 m^2/g	**Endcapping**	-	**Preparative Column (Prep Series)**	-
Pore Size	12 nm	**C%**	-	➡P. 18	
Pore Volume	1 mL/g				

Analysis Example

Analysis of Sugars

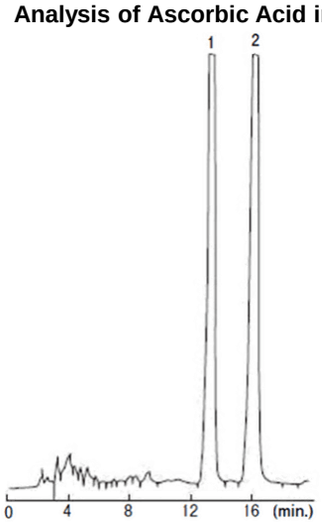


No.	Analyte	No.	Analyte	No.	Analyte
1	Betaine	**4**	Sucrose	**7**	Raffinose
2	Fructose	**5**	Inositol		
3	Glucose	**6**	1-Kestose		

Analysis condition

Column : Wakosil® $5NH_2$ 4.6 mm × 150 mm
Column temperature : 35°C
Mobile phase : CH_3CN/H_2O = 75/25 (v/v)
Flow rate : 1.0 mL/min.
Detection : RI

Analysis of Ascorbic Acid in Orange Juice

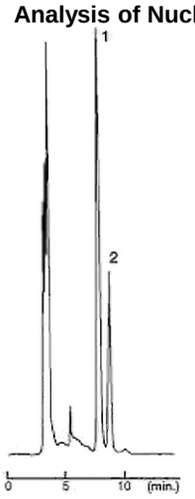


No.	Analyte	No.	Analyte
1	Erythorbic Acid	**2**	Ascorbic Acid

Analysis condition

Column : Wakosil® $5NH_2$ 4.6 mm × 250 mm
Column temperature : 35°C
Mobile phase : CH_3CN/0.01 M KH_2PO_4 = 80/20 (v/v)
Flow rate : 1.2 mL/min.
Detection : UV 254 nm

Analysis of Nucleotide Monophosphates



No.	Analyte	No.	Analyte
1	IMP	**2**	GMP

Analysis condition

Column : Wakosil® $5NH_2$ 4.6 mm × 250 mm
Mobile phase : Ethanol/0.1 M KH_2PO_4 = 10/90 (v/v)
Flow rate : 1.0 mL/min.
Detection : UV 254 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Normal-phase Chromatography > Wakopak Wakosil® $5NH_2$
https://labchem-wako.fujifilm.com/asia/category/01062.html

Specialty Columns

Wakopak Wakosil® 5Diol for Size Exclusion Chromatography

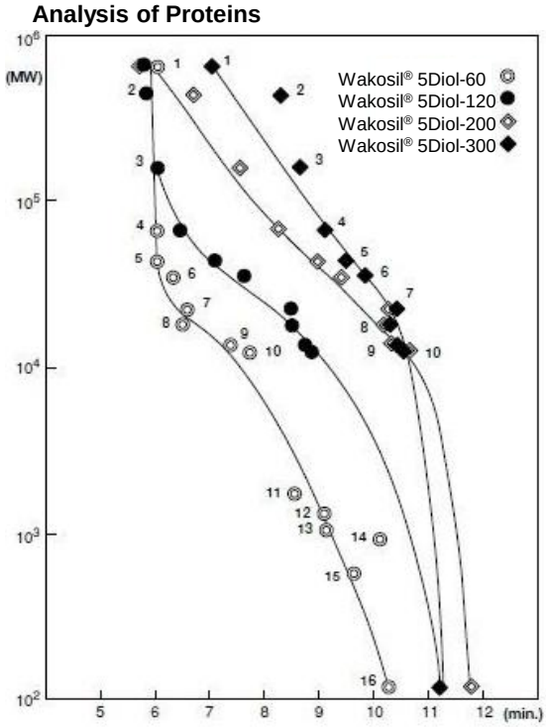
This column uses gel filtration packing material composed of 5 µm, porous, spherical silica gel modified with diol group (OH). The silica gel base packing material with superior physical strength compared to the polymer base packing material enables stable separation even when used continuously under high pressure and high flow rate. There are 4 different pore sizes (6, 12, 20, 30 nm) of packing material, suitable for the analysis of water-soluble polymers with ranging from several hundred to several hundred thousand of molecular weights.

Features

- ✓ Enables stable separation even when used continuously under high pressure and high flow rate.
- ✓ Available in four pore sizes (6, 12, 20, 30 nm) to match molecular weight.

Analysis Example

Analysis of Proteins



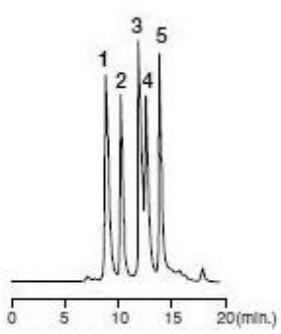
No.	Analyte	No.	Analyte
1	Thyroglobulin (M.W. 660,000)	9	Ribonuclease A (M.W. 13,700)
2	Ferritin (M.W. 440,000)	10	Cytochrome C (M.W. 12,400)
3	γ-Globulin (M.W. 160,000)	11	α-Endorphin (M.W. 1,746)
4	Bovine serum albumin (M.W. 67,000)	12	Angiotensin-I (M.W. 1,296)
5	Ovalbumin (M.W. 44,000)	13	Angiotensin-II (M.W. 1,046)
6	β-Lactoglobulin (M.W. 35,000)	14	Angiotensin-III (M.W. 931)
7	α-Chymotrypsinogen A (M.W. 22,400)	15	Met-Enkephalin (M.W. 574)
8	Myoglobin (M.W. 18,000)	16	Valine (M.W. 117)

Analysis condition

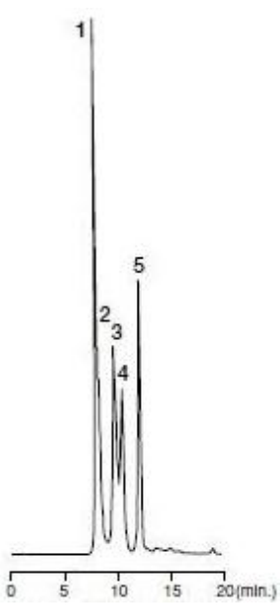
Column size	:	8.0 mm × 300 mm
Column temperature	:	40°C
Mobile phase	:	Diol-60 : 0.1 M Na phosphate buffer (pH7.4)/ CH_3CN = 80/20 (v/v)
		Diol-120/200/300: 0.2 M NaCl in 0.1 M Na phosphate buffer (pH7.0)
Flow rate	:	1.0 mL/min.
Detection	:	UV 220 nm

Analysis of Enzymes

Wakosil® 5Diol-300



Wakosil® 5Diol-200



Wakosil® 5Diol-120

No.	Analyte	No.	Analyte
1	Glutamate Dehydrogenase (M.W. 290,000)	4	Adenylate Kinase (M.W. 32,000)
2	Lactate Dehydrogenase (M.W. 142,000)	5	Cytochrome C (M.W. 12,400)
3	Enolase (M.W. 67,000)		

Analysis condition

Column size	:	8.0 mm × 300 mm
Column temperature	:	40°C
Mobile phase	:	0.2 M NaCl in 0.1 M Na phosphate buffer (pH7.0)
Flow rate	:	0.7 mL/min.
Detection	:	UV 280 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Size Exclusion Chromatography Column > Wakopak Wakosil® 5Diol Series
https://labchem-wako.fujifilm.com/asia/category/01304.html

Wakopak Combi ODS/ODS-fast/CN for Combinatorial Chemistry

This column is designed for the field of combinatorial chemistry* that can accommodate a wide variety of compounds and enables rapid analysis, separation, and purification.

*By preparing multiple varieties of each element (block) that make up a compound and synthesizing all possible combinations at once, and then screening them to identify compounds with the desired functions and activities.

Comparison of Wakopak Combi

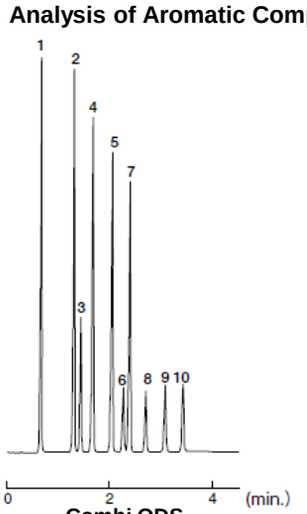
Wakopak	Combi ODS	Combi ODS-fast	CN
Functional Group	Octadecyl (C18)	Octadecyl (C18)	Cyanopropyl (CN)
Separation Mode	Reversed phase	Reversed phase	Reversed-phase/Normal-phase
Particle Size (μm)	5	3	5
Endcapping	✓	✓	-
Features	Standard performance	Enables rapid analysis compared to Combi ODS	Compared to ODS, retention of hydrophilic compounds is higher, retention of hydrophobic compounds is lower
Preparative Column	✓	-	✓

Features

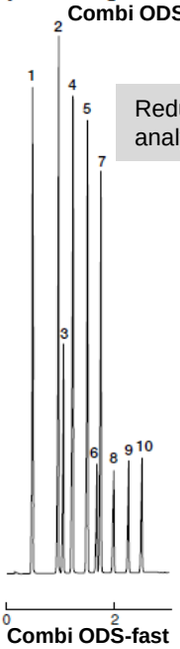
- ✓ End-cap treatment ➡P. 5 ensures high separation and retention even with mobile phases containing a high proportion of water. Also effective for the analysis of basic compounds.
- ✓ Low column pressure allows for high-flow-rate gradient conditions.
- ✓ A wide range of inner diameters (2.0 - 28 mm) is available, facilitating scale-up from analysis to preparative chromatography. (Combi ODS/CN)
- ✓ The 3 μm particle size packing material reduces analysis time.(Combi ODS-fast)

Analysis Example

Analysis of Aromatic Compounds (Combi ODS/ODS-fast)



Combi ODS



Combi ODS-fast

Reduces analysis time

No.	Analyte	No.	Analyte	No.	Analyte
1	*p*-Hydroxybenzoic Acid	**5**	Propyl *p*-Hydroxybenzoate	**9**	Propyl Salicylate
2	Methyl *p*-Hydroxybenzoate	**6**	Methyl Salicylate	**10**	Butyl Salicylate
3	Salicylic Acid	**7**	Butyl *p*-Hydroxybenzoate		
4	Ethyl *p*-Hydroxybenzoate	**8**	Ethyl Salicylate		

Analysis condition

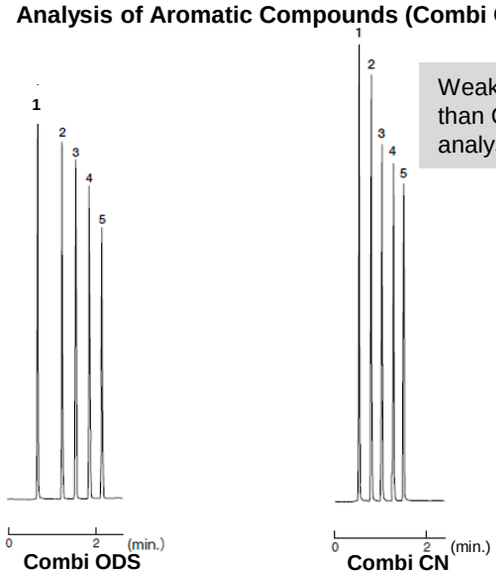
		Combi ODS	Combi ODS-fast
Column size	:	4.6 mm × 50 mm	4.6 mm × 30 mm
Column temperature	:	R.T.	
Mobile phase	:	A) CH_3CN/H_2O = 5/95 (v/v), 0.05% TFA B) CH_3CN/H_2O = 95/5 (v/v), 0.05% TFA	

Time (min.)	B conc. (%)
0-3.5	0-80
3.5-4.5	80

Time (min.)	B conc. (%)
0-2.5	0-80
2.5-3.0	80

Flow rate	:	3.0 mL/min.
Detection	:	UV 280 nm

Analysis of Aromatic Compounds (Combi ODS/CN)



Weaker retention than ODS reduces analysis time

No.	Analyte	No.	Analyte
1	*p*-Hydroxybenzoic Acid	4	Propyl *p*-Hydroxybenzoate
2	Methyl *p*-Hydroxybenzoate	5	Butyl *p*-Hydroxybenzoate
3	Ethyl *p*-Hydroxybenzoate		

Analysis condition

Column size : 4.6 mm × 50 mm
Column temperature : R.T.
Mobile phase : A) CH_3CN/H_2O = 95/5 (v/v), 0.05% TFA
B) CH_3CN/H_2O = 95/5 (v/v), 0.05% TFA
Flow rate : 2.0 mL/min.
Detection : UV 254 nm

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Special HPLC Column
> HPLC Column for Combinatorial Chemistry "Wakopak Combi Series" https://labchem-wako.fujifilm.com/asia/category/01093.html

Wakopak Wakosil®-PAHs for polycyclic aromatic hydrocarbon (PAHs) analysis

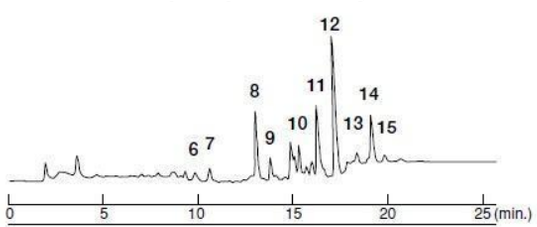
This column is a column designed for analyzing Polycyclic Aromatic Hydrocarbons (PAHs), offering high stereoselectivity, excellent number of theoretical plates, and sharp peak resolution. PAHs are hydrocarbons formed by fused aromatic rings without heteroatoms or substituents, produced by incomplete combustion or thermal decomposition of organic matter. They are commonly found in smoked and grilled foods. The International Agency for Research on Cancer (IARC) has classified 60 types of PAHs as substances suspected of being carcinogenic and genotoxic.

Features

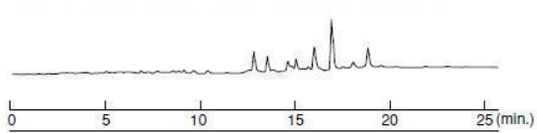
✓ Demonstrates high stereoselectivity, number of theoretical plates, and resolution for PAHs

Analysis of 15 PAHs

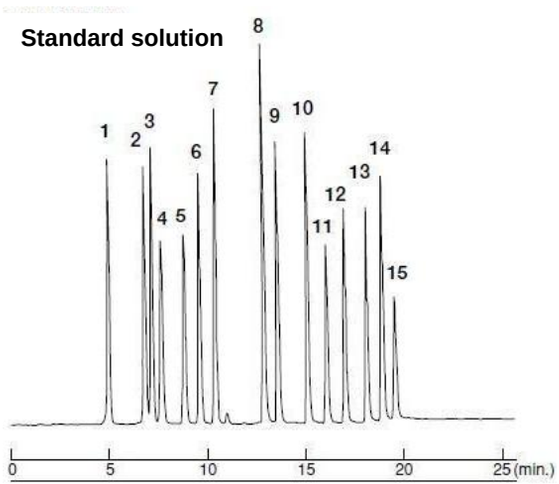
Outdoor air samples (extracted by Benzene/EtOH)



Outdoor air samples (extracted Dichloromethane)



Standard solution



No.	Analyte	No.	Analyte
1	Naphthalene	9	Chrysene
2	Acenaphthene	10	Benzo[*b*]fluoranthene
3	Fluorene	11	Benzo[*k*]fluoranthene
4	Phenanthrene	12	Benzo[*a*]pyrene
5	Anthracene	13	Dibenzo[*a*,*h*]anthracene
6	Fluoranthene	14	Benzo[*g*,*h*,*i*]perylene
7	Pyrene	15	Indeno[1,2,3-*cd*]pyrene
8	Benzo[*a*]anthracene		

Analysis condition

Column : Wakosil®-PAHs 4.6 mm × 250 mm
Column temperature : 30°C
Mobile phase : A) CH_3OH/H_2O = 80/20 (v/v)
B) CH_3CN

Time (min.)	B conc. (%)
0-5	10
5-15	10-75
15-25	75

Flow rate : 1.0 mL/min.
Detection :

Time (min.)	FL
0.0	λ_{ex} 280 nm λ_{em} 330 nm
6.0	λ_{ex} 260 nm λ_{em} 340 nm
8.1	λ_{ex} 250 nm λ_{em} 420 nm
12.0	λ_{ex} 270 nm λ_{em} 400 nm
17.5	λ_{ex} 295 nm λ_{em} 410 nm
19.1	λ_{ex} 300 nm λ_{em} 500 nm

Click here for details
TOP > Analytical Chemistry > Environmental Analysis > Polycyclic Aromatic Hydrocarbon (PAH) Analysis
https://labchem-wako.fujifilm.com/asia/category/00364.html

Wakopak Wakosil® AS-Aqua/Wakosil®-II 3C8RS for Analysis of Anionic Surfactants

This column is suitable for the analysis of Linear Alkylbenzene Sulfonic acid (LAS), a type of anionic surfactant found in water. LAS exists as a mixture of isomers, and numerous peaks elute on conventional ODS columns. Wakosil® AS-Aqua and Wakosil®-II 3C8RS separate the multiple isomeric peaks of LAS into a single peak for each carbon chain length in HPLC and LC/MS analysis, thereby, simplifying quantification and reducing analysis time. Furthermore, the linear-chain form (LAS) and branched-chain forms can be separated and distinguished.

Features

✓ Capable of separating multiple LAS isomer peaks into a single peak for each carbon chain length

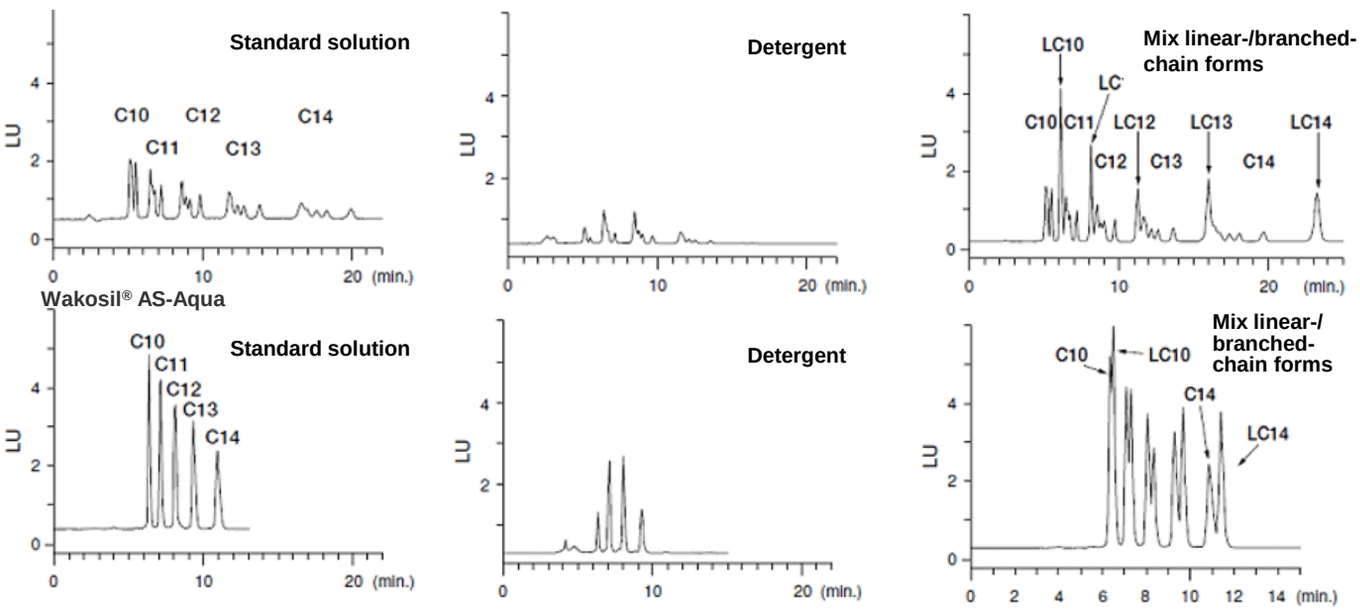
Wakopak Wakosil® AS-Aqua (for HPLC)

This HPLC column can separate the multiple isomeric peaks of LAS into a single peak for each carbon chain length. It also enables the separation and differentiation of linear-chain form (LAS) and branched-chain forms.

Analysis Example

Comparison of the Navi C18-5 (ODS Column) and Wakosil® AS-Aqua in the Analysis of Ionic Surfactants

Navi C18-5



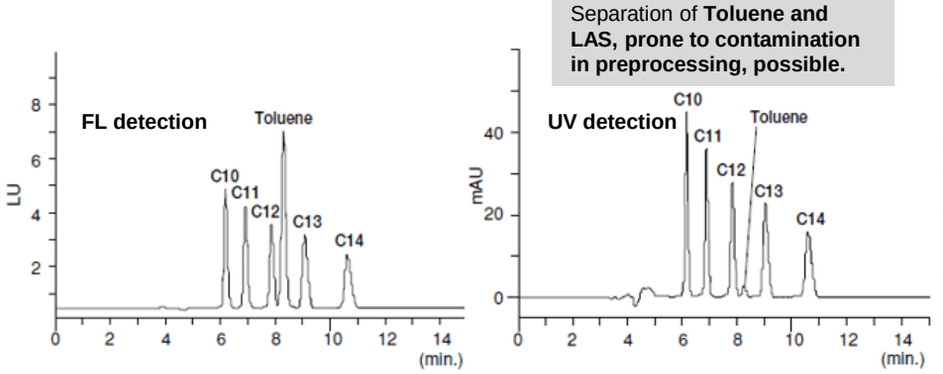
Separation of linear-/branched-chain forms possible.

No.	Analyte	No.	Analyte
C10	Decylbenzenesulfonate	C13	Tridecylbenzenesulfonate
C11	Undecylbenzenesulfonate	C14	Tetradecylbenzenesulfonate
C12	Dodecylbenzenesulfonate		

Analysis condition

Column size : 4.6 mm × 250 mm
Mobile phase : CH_3CN/H_2O = 65/35 (v/v) +12.3 g/1,000 mL $NaClO_4$
Flow rate : Navi : 1.0 mL/min. AS-Aqua: 0.7 mL/min.
Detection : FL λ_{ex} 221 nm λ_{em} 284 nm

Separation of LAS Standard Solution and Toluene



Separation of **Toluene and LAS, prone to contamination in preprocessing, possible.**

Analysis condition

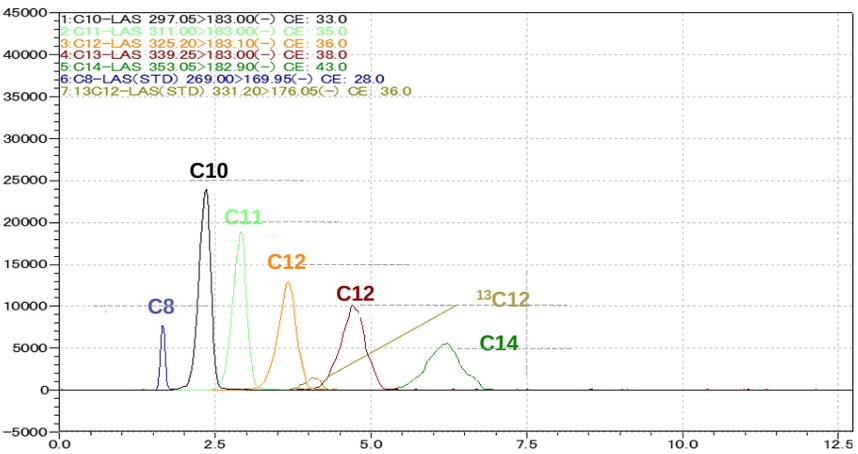
Column : Wakosil® AS-Aqua 4.6 mm × 250 mm
Colum temperature : 40°C
Mobile phase : CH_3CN/H_2O = 65/35 (v/v) +12.3 g/1,000 mL $NaClO_4$
Flow rate : 0.7 mL/min.
Detection : FL : λ_{ex} 221 nm λ_{em} 284 nm UV: 225 nm

Wakopak Wakosil®-II 3C8RS (for LC/MS)

This column is capable of detecting multiple isomeric peaks of LAS as single peaks for each carbon chain length under the test conditions specified by Japan's Tap Water Quality Testing Methods (LC-MS method: Appendix 24-2).

Analysis Example

LC/MS/MS Analysis of LAS (C10 - C14) inby Japan's Tap Water Quality Testing Methods*



Analysis condition

Column	:	Wakosil®-II 3C8RS 2.0 mm × 150 mm
Colum temperature	:	40°C
Mobile phase	:	H_2O/CH_3CN = 40/60 (v/v)
Flow rate	:	0.3 mL/min.
Detection	:	MS

Monitoring Ions (*m/z*)

Analyte	Monitoring Ions		Mode
	Precursor	Product	
C8	269	183	-
C10	297	183	-
C11	311	183	-
C12	325	183	-
^{13}C12	331	176	-
C13	339	183	-
C14	353	183	-

* While the notification method specifies the addition of 0.1% formic acid to mobile-phase A and B as examples, these test conditions do not include the addition of 0.1% formic acid to the mobile phase.

Click here for details
TOP > Analytical Chemistry > Water Quality > Drinking Water > Anionic Surfactant (LAS) Analysis
https://labchem-wako.fujifilm.com/asia/category/00343.html

Wakopak Wakosil® Agri-9/-Cu for Pesticide Residue Analysis

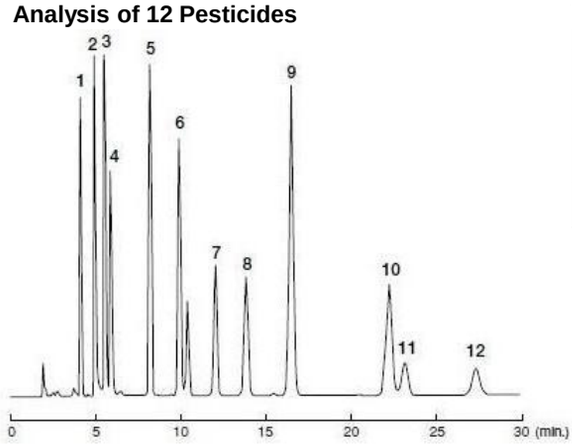
This column is optimized for the analysis of pesticide residues in water and food. When used in combination with the dedicated mobile phase (Wakosil® Agri-9 Eluent), guarantees the separation of various pesticides - including Ashram and Oxine-Cu - in simultaneous analysis, which is generally considered difficult to achieve in standard analyses. Wakosil®-Cu enables the effective separation (with minimal peak tailing) of Oxine-Cu, which is known to be prone to peak tailing due to metal coordination in standard analyses.

Features

- ✓ When used in combination with Wakosil® Agri-9 Eluent, the separation of 9 pesticides (MCPP, TPN, Asulam, Iprodione, Oxine-Cu, Siduron, Thiram, Pencyclon, and Bensulide) is guaranteed. (Wakosil® Agri-9)
- ✓ When used in combination with Wakosil® Agri-9 Eluent, the separation of 5 pesticides (MCPP, Asulam, Oxine-Cu, Thiuram, Triclopyr) is guaranteed. (Wakosil® Agri-9)
- ✓ When used in combination with Wakosil® Agri-9 mobile phase, good separation (minimal peak tailing) of Oxine-Cu is guaranteed. (Wakosil®-Cu)

Analysis Example

Analysis of 12 Pesticides



No.	Analyte	No.	Analyte	No.	Analyte
1	Asulam	5	Thiuram	9	TPN
2	Oxine-Cu	6	Siduron	10	Pencycuron
3	CAT	7	Propyzamide	11	Bensulide
4	MCPP	8	Iprodione	12	Butamifos

Analysis condition

Column	:	Wakosil® Agri-9 4.6 mm × 250 mm
Column temperature	:	35°C
Mobile phase	:	Wakosil® Agri-9 Eluent
Flow rate	:	1.0 mL/min.
Detection	:	UV 230-270 nm

Related Products: Mobile Phase

Code No.	Product Name	Grade	Volume
238-01281	Wakosil® Agri-9 Eluent, for 4.6 × 250 mm	for Pesticide Residue Analysis	1 L
237-01631	Wakosil® Agri-9 Eluent, Type II, for 4.6 × 250mm	for Pesticide Residue Analysis	1 L

Click here for details
TOP > Analytical Chemistry > Pesticide & Veterinary Drug Analysis > HPLC Analysis > HPLC Column for Pesticide Residue Analysis "Wakopak Wakosil® Agri-9"
https://labchem-wako.fujifilm.com/asia/category/01094.html

Wakopak Wakosil® DNPH for the Analysis of DNPH-derivatized Aldehydes/Ketones

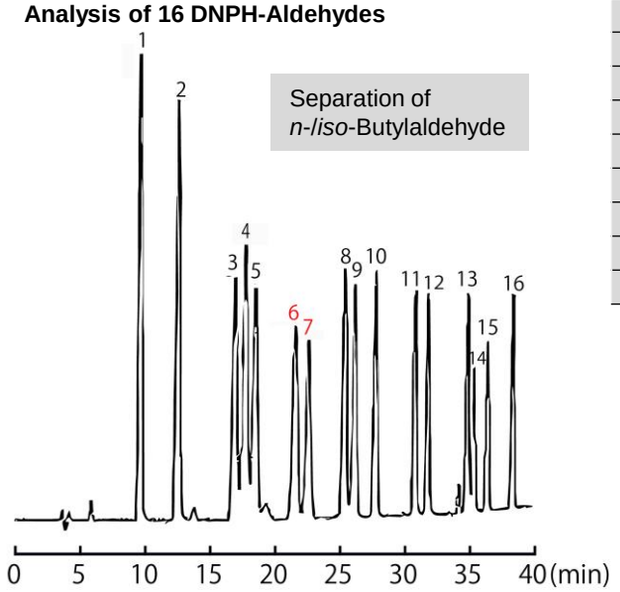
This column is optimized for simultaneous analysis of aldehydes and ketones derivatized with 2,4-**D**i**N**itro**P**henyl**H**ydrazone (DNPH). As harmful air pollutants, aldehydes are subject to regulation and monitoring under Japan's Air Pollution Control Act and Offensive Odor Control Act. Wakosil® DNPH, with a dedicated mobile phase, can separate *n*- and *iso*-butyl aldehydes, which are challenging for standard HPLC columns, achieving results comparable to gas chromatography.
Wakosil® DNPH-II can analyze 15 DNPH-aldehydes regulated by the U.S. EPA in under 20 minutes using a dedicated mobile phase.

Features

- ✓ When used in combination with Wakosil® DNPH Eluent, *n*- and *iso*-butyl aldehydes can be separated (Wakosil® DNPH)
- ✓ When used in combination with Wakosil® DNPH-II Eluent, the 15 DNPH-aldehydes regulated by the U.S. EPA can be analyzed in less than 20 minutes. (Wakosil® DNPH-II)

Analysis Example

Analysis of 16 DNPH-Aldehydes



No.	Analyte	No.	Analyte
1	Formaldehyde-2,4-DNPH	9	*iso*-Valeraldehyde-2,4-DNPH
2	Acetaldehyde-2,4-DNPH	10	*n*-Valeraldehyde-2,4-DNPH
3	Propionaldehyde-2,4-DNPH	11	Benzaldehyde-2,4-DNPH
4	Acrolein-2,4-DNPH	12	Hexaldehyde-2,4-DNPH
5	Acetone-2,4-DNPH	13	*o*-Tolualdehyde-2,4-DNPH
6	***iso*-Butyraldehyde-2,4-DNPH**	14	*m*-Tolualdehyde-2,4-DNPH
7	***n*-Butyraldehyde-2,4-DNPH**	15	*p*-Tolualdehyde-2,4-DNPH
8	Crotonaldehyde-2,4-DNPH	16	2,5-Dimethylbenzaldehyde-2,4-DNPH

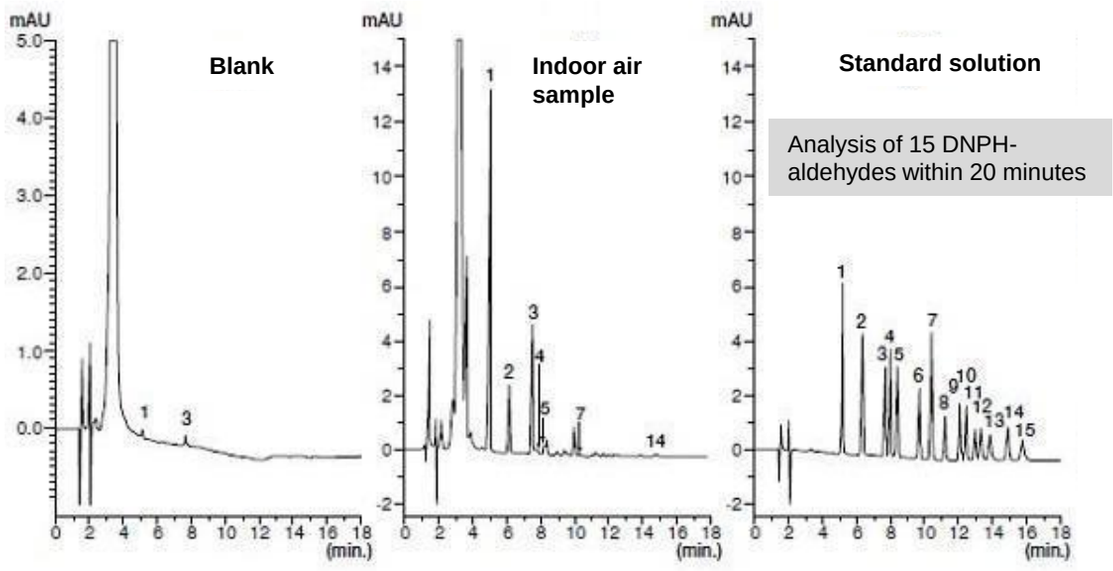
Analysis condition

Column : Wakosil® DNPH 4.6 mm × 250 mm
Column temperature : 37°C
Mobile phase : A) Wakosil® DNPH Eluent A
B) Wakosil® DNPH Eluent B

Time (min.)	B conc. (%)
0-16	10
16-35	10-90
35-45	90

Flow rate : 0.6 mL/min.
Detection : UV 360 nm

Rapid Analysis of 15 DNPH-aldehydes



No.	Analyte	No.	Analyte
1	Formaldehyde-2,4-DNPH	9	*iso*-Valeraldehyde-2,4-DNPH
2	Acetaldehyde-2,4-DNPH	10	*n*-Valeraldehyde-2,4-DNPH
3	Acetone-2,4-DNPH	11	*o*-Tolualdehyde-2,4-DNPH
4	Acrolein-2,4-DNPH	12	*m*-Tolualdehyde-2,4-DNPH
5	Propionaldehyde-2,4-DNPH	13	*p*-Tolualdehyde-2,4-DNPH
6	Crotonaldehyde-2,4-DNPH	14	Hexaldehyde-2,4-DNPH
7	*n*-/*iso*-Butyraldehyde-2,4-DNPH	15	2,5-Dimethylbenzaldehyde-2,4-DNPH
8	Benzaldehyde-2,4-DNPH		

Analysis condition

Column Wakosil® DNPH-II 4.6 mm × 150 mm

Colum temperature 35°C

Mobile phase A) Wakosil® DNPH-II Eluent A
B) Wakosil® DNPH-II Eluent B

Time (min.)	B conc. (%)
0-10	0-100
10-16	100

Flow rate 1.0 mL/min.

Detection UV 360 nm

Related Products: Mobile Phase

Code No.	Product Name	Grade	Volume
233-01611	Wakosil® DNPH Eluent A	for HPLC	1 L
230-01621	Wakosil® DNPH Eluent B	for HPLC	1 L
236-02181	Wakosil® DNPH-II Eluent A	for HPLC	1 L
233-02191	Wakosil® DNPH-II Eluent B	for HPLC	1 L

Related Products: Presep®-C DNPH/Ozone Scrubber

Presep®-C DNPH is a solid-phase extraction column that uses a packing material coated with DNPH on silica gel, enabling the capture and derivatization of aldehydes prior to HPLC analysis. Presep®-C Ozone Scrubber is a solid-phase extraction column packed with high-purity potassium iodide. It removes ozone, which interferes with the capture of aldehydes and DNPH derivatization.

Code No.	Product Name	Amount of Packing Material	Grade	Volume
290-34251	Presep®-C DNPH	0.8 g	for Sample Pretreatment	20 pcs
291-43951	Presep®-C DNPH (Short)	0.4 g	for Sample Pretreatment	20 pcs
293-40351	Presep®-C Ozone Scrubber	-	for Sample Pretreatment	20 pcs

Click here for details
TOP > Analytical Chemistry > Environmental Analysis > VOC and Stinking Substances Analysis
https://labchem-wako.fujifilm.com/asia/category/00691.html

Ultra APDS TAG® for Amino Acid Analysis

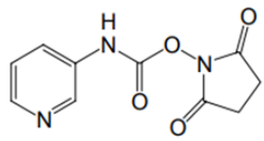
This column is optimized for the pre-column derivatization method used in LC/MS analysis of amino acids derivatized with APDS TAG®, and (*R*)-BiAC. It enables the separation and detection of amino acids with same *m/z*, such as Leucine and Isoleucine.

Features

✓ Capable of separating and detecting amino acids with the same *m/z*, such as Leucine and Isoleucine

APDS Method

The APDS method is a precolumn derivatization LC/MS method for amino acids that uses APDS (3-Aminopyridyl-*N*-hydroxysuccinimidyl carbamate) TAG® as the derivatization reagent.
It reduces analysis time by distinguishing amino acids with identical retention times based on *m/z* values. APDS TAG® also enhances ionization efficiency, allowing highly sensitive detection, especially in LC/MS/MS.



APDS TAG®

Analysis Example

Analysis of Amino Acids in Amino Acid-containing Beverages using the APDS TAG®

Sample Preparation

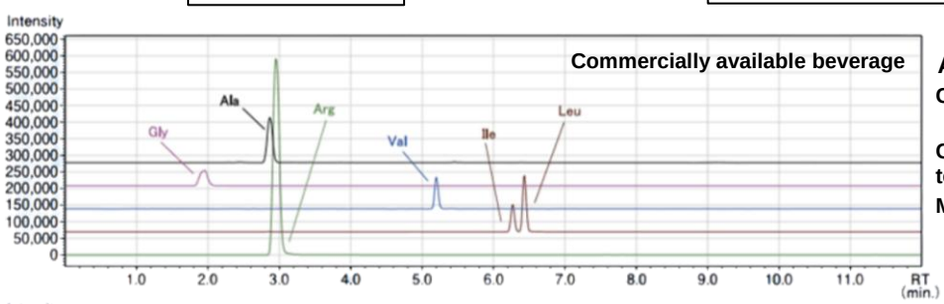
1) Sample or Standard Solution 20 µL + Internal Standard Solution 20 µL + Acetonitrile 40 µL
2) Stirring
3) Centrifugation (15,000 rpm, 20°C, 10 min.)

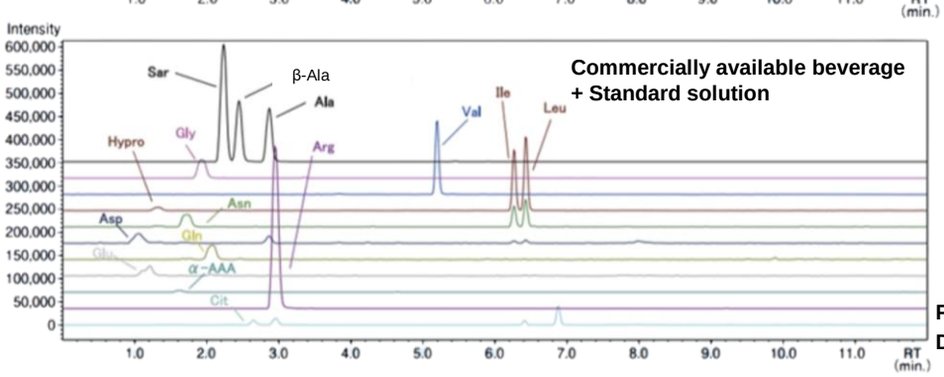
Supernatant 20 µL

Derivatization

1) Supernatant 20 µL + APDS TAG® Wako Borate Buffer 60 µL + APDS TAG® (20 mg/mL Acetonitrile solution) 20 µL
2) Pipetting × 5

1) Stirring
2) Incubation (55°C, 10 min.)
3) Cooling (R.T.)
4) + 0.1% HCOOH aq./APDS TAG® Wako Eluent = 1/3





Analysis condition

Column : Ultra APDS TAG®
2.1 mm × 100 mm

Colum temperature : 40°C

Mobile phase : A) APDS TAG® Wako Eluent
B) 60% CH_3CN

Time (min.)	B conc. (%)
0.00-0.05	6-8
0.05-1.70	8
1.70-1.71	8-12
1.71-4.95	12-30
4.95-5.95	30-60
5.95-5.96	60-95
5.96-6.70	95
6.70-6.71	95-6
6.71-12.0	6

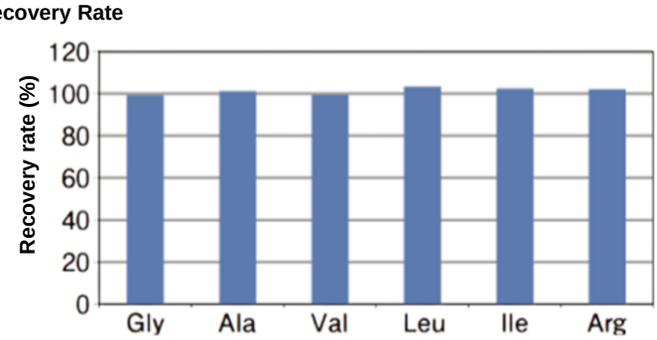
Flow rate : 0.3 mL/min.

Detection : MS

Monitoring Ions (*m/z*)

Analyte	Monitoring Ions		Mode	Analyte	Monitoring Ions		Mode
	Precursor	Product			Precursor	Product	
Gly	196.1	121.0	+	Arg	295.1	175.1	+
Gly-$^{13}C_2$,^{15}N	199.1	121.1	+	Arg-$^{15}N_4$	299.1	179.1	+
Ala	210.1	121.0	+	Sar	210.0	121.0	+
Ala-$^{13}C_3$	213.1	121.1	+	Hypro	252.1	121.0	+
Val	238.1	121.0	+	Asn	253.1	121.0	+
Val-$^{13}C_5$,^{15}N	244.1	121.1	+	Asp	254.1	121.0	+
Leu	252.1	121.0	+	Gln	267.1	121.0	+
Ile	252.1	121.0	+	Glu	268.1	121.0	+
Leu-5,5,5-d_3	255.1	121.1	+	α-AAA	282.1	121.0	+
Ile-$^{13}C_6$,^{15}N	259.1	121.1	+	Cit	296.3	121.0	+

Recovery Rate



Rerated Products: APDS TAG®

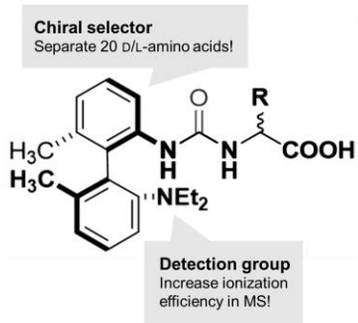
Code No.	Product Name	Grade	Volume
014-23841	Amino Acid Analysis Reagent (for LC/MS) (APDSTAG®)	for Amino Acid Automated Analysis	100 mg
019-23151	APDS TAG® Wako Borate Buffer	for Amino Acid Automated Analysis	1 L
010-23061	APDS TAG® Wako Eluent	for Amino Acid Automated Analysis	1 L

Click here for details
TOP > Analytical Chemistry > Amino Acid, Peptides & Proteins > Amino Acid Analysis (Quantitative/Compositional analysis) > APDS Method
https://labchem-wako.fujifilm.com/asia/category/00437.html

(*R*)-BiAC Method (Chiral Amino Acid Analysis)

Amino acids are common compounds in living organisms, existing mainly as L-amino acids, with D-amino acids present in trace amounts. Recent studies show D-amino acids play roles in functions like memory and learning, making their separate analysis important. (*R*)-BiAC is a derivatization reagent used in LC/MS to analyze D- and L-amino acids through pre-column derivatization. Using (*R*)-BiAC and the derivatization reagents set allows for high-resolution, rapid (19 min.) chiral amino acid analysis without specialized equipment.

1) Hashimoto, A., Oka, T.: *Prog. Neurobiol.*, **52**, 325 (1997).



Analysis Example

Analysis of Chiral Amino Acids in Human Urine Using (*R*)-BiAC

Sample preparation

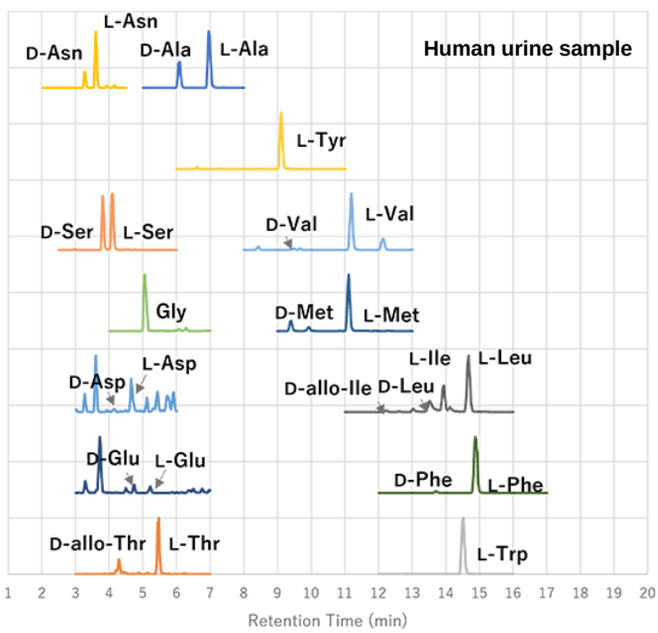
1) Sample or Standard Solution 20 µL + Internal Standard Solution 20 µL + Acetonitrile 40 µL
2) Stirring
3) Centrifugation (20,000×g, 10 min.)

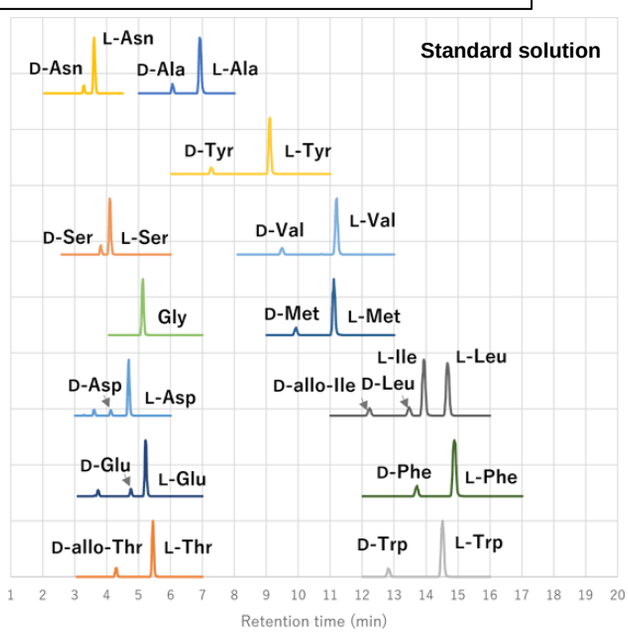
Supernatant 20 µL

Derivatization

1) Supernatant 20 µL+ (*R*)-BiAC-Acetonitrile Solution 30 µL + (*R*)-BiAC Solution 10 µL
2) Pipetting x 5

1) Stirring
2) Heating (55°C, 10 min.)
3) Cooling (R.T.)
4) + Reaction Terminator 100 µL





Analysis condition

Column : Ultra APDS TAG® 2.1 mm × 100 mm
Colum temperature : 40°C
Mobile phase : A) 0.1% HCOOH in 10 mM $HCOONH_3$ aq.
B) 95% CH_3CN in H_2O

Time (min.)	B conc. (%)
0.0-3.0	14-16
3.0-14.3	16-33
14.3-17.0	33-45
17.0-17.1	45-90
17.1-18.0	90
18.0-18.1	90-14
18.1-20.0	14

Flow rate : 0.4 mL/min.
Detection : MS

Monitoring Ions (*m/z*)

Analyte	Monitoring Ions		Analyte	Monitoring Ions	
	Precursor	Product		Precursor	Product
D-Asn	427	295.1	D-Tyr	476	295.1
L-Asn	428	295.1	L-Tyr	477	295.1
D-Gln	441	295.1	D-Val	412	295.1
L-Gln	442	295.1	L-Val	413	295.1
D-Ser	400	295.1	D-Met	444	295.1
L-Ser	401	295.1	L-Met	445	295.1
Gly	371	295.1	D-allo-Ile	426	295.1
D-Asp	428.2	295.1	L-Ile	427	295.1
L-Asp	429.2	295.1	D-Leu	426	295.1
D-Glu	442	295.1	L-Leu	427	295.1
L-Glu	443	295.1	D-Phe	460.1	295.1
D-allo-Thr	414	295.1	L-Phe	461.1	295.1
L-Thr	415	295.1	D-Trp	499	295.1
D-Ala	384.1	295.1	L-Trp	500	295.1
L-Ala	385.1	295.1			

Rerated Products: (*R*)-BiAC

Code No.	Product Name	Grade	Volume
025-19761	(*R*)-BiAC	for Amino Acid Analysis	5 mg
296-86001	(*R*)-BiAC Derivatization Reagents Set	for Amino Acid Analysis	1 Kit

Click here for details
TOP > Analytical Chemistry > Amino Acid, Peptides & Proteins > Amino Acid Analysis (Quantitative/Compositional analysis) > (*R*)-BiAC Method (Chiral Amino Acid LC/MS Analysis)
https://labchem-wako.fujifilm.com/asia/category/03157.html

Wakopak Wakobeads-T for Sugar and Sugar Alcohol Analysis

This is a column for the analysis of sugars, sugar alcohols, and organic acids, utilizing a styrene-divinylbenzene-based porous spherical packing material. In sugar analysis, it enables molecular-size-based analysis ranging from monosaccharides to polysaccharides.

Features

- ✓ Capable of analyzing from monosaccharides to polysaccharides (up to a molecular weight of several hundred thousand) by molecular size.
- ✓ Capable of separating and analyzing oligosaccharides of different types with the same molecular weight.
- ✓ A lineup of special columns for organic acid analysis (T-132-E) and columns for rapid analysis of sweeteners (T-131-S)

Comparison of Wakobeads-T

Wakobeads	T-130-E	T-131-E	T-131-S	T-331	T-240	T-132-E
Column Size (mm)	7.8×300	7.8×300	8.0×100	10.0×300	10.0×300	7.8×300
Exclusion Limit (M.W.)	1×10^3	1×10^3	1×10^3	3×10^3	2×10^4	-
Number of Theoretical Plates	12,000	7,000	1,000	5,000	8,000	16,000
Upper Limit Flow Rate (mL/min.)	1.2	1.3	2.0	2.0	2.0	1.0
Upper Limit Pressure (kg/cm^3)	40	40	40	20	10	40
Upper Limit Temperature (°C)	85	85	85	85	85	85
Analyte	Sugars/Sugar Alcohols		Sweeteners	Sugars/Sugar Alcohols		Organic Acids

Elution Times of Sugars and Sugar Alcohols in Wakobeads-T-331

Analyte	Digitoxose	Xylose	Arabinose	Ribose	Lyxose	Xylitol	Rhamnose	Fucose	Glucose	Sorbose	Galactose	Mannose	Fructose	Inositol	Mannitol
M.W.	148	150	150	150	150	152	164	164	180	180	180	180	180	180	182
T-331	19.9	19.1	22.2	24.6	20.5	22.9	19.8	23.6	19.0	18.7	21.6	22.1	21.6	26.5	20.7

Analyte	Sorbitol	Glucoheptose	Trehalose	Maltose	Cellobiose	Sucrose	Melibiose	Gentiobiose	Isomaltose	Lactose	Multitose	Melezitose	Raffinose
M.W.	182	210	342	342	342	342	342	342	342	342	344	504	504
T-331	22.7	19.3	16.4	17.4	17.2	16.2	19.7	17.0	18.3	19.7	20.0	14.4	16.4

Analyte	Maltotriose	Stachyose
M.W.	504	666
T-331	16.4	16.2

Analysis condition

Column temperature : 60°C
Mobile phase : H_2O
Flow rate : 1.0 mL/min.

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Special HPLC Column
> HPLC Column for Sugar/Sugar Alcohol Analysis "Wakopak Wakobeads-T Series"
https://labchem-wako.fujifilm.com/asia/category/01096.html

Wakopak Wakosil®-DNA for Oligo DNA Analysis

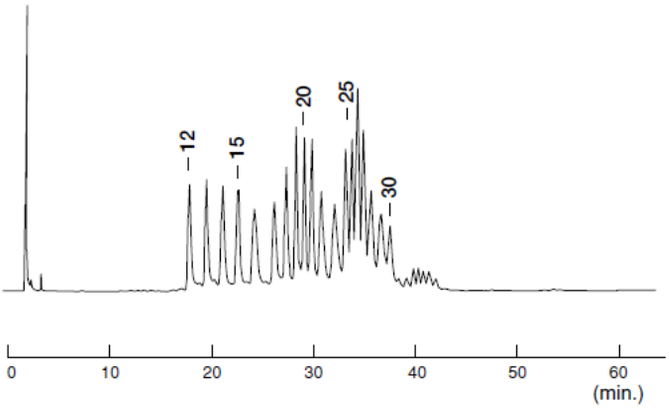
This is a column for the analysis and preparative separation of oligonucleotides. Efficient analysis and preparative separation of synthetic ssDNA (single-stranded DNA) up to several tens of mer for each 1 mer difference. This column uses well-selected silica gel and exhibits high separation efficiency and recovery rate. In addition, the quality is guaranteed by the analysis test of oligo DNA for each lot of packing material.

Features

- ✓ Efficiently analysis and preparative separation of synthetic ssDNA with a single-mer difference (up to several tens of mers)
- ✓ Oligo DNA analysis tests are performed on each packing material lot, and the results are included with the product

Analysis Example

Analysis of Oligodeoxyadenosine (12 to 30 mer)



Analysis condition

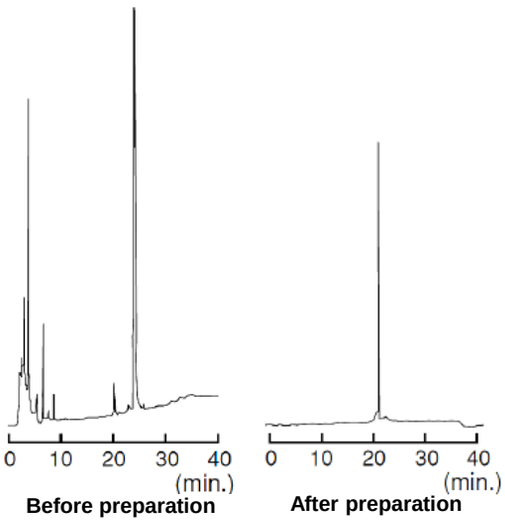
Column : Wakosil® DNA 4.6 mm × 150 mm
Column temperature : R.T.
Mobile phase : A) 0.1 M TEAA (pH7.0)
B) CH_3CN/0.1 M TEAA (pH7.0) = 50/50 (v/v)

Time (min.)	B conc. (%)
0-60	12-20

Flow rate : 1.0 mL/min.
Detection : UV 260 nm

Examples of Preparative Applications

Preparative Separation of Synthetic DNA (19 mer)



Before preparation　　After preparation

Analysis condition

		Before preparation	After preparation
Column	:	Wakosil®-DNA 4.6 mm × 150 mm	
Mobile phase	:	A) 0.1 M TEAA (pH7.0) B) CH_3CN	
		Time (min.) / **B conc. (%)**: 0-30 / 10-20	**Time (min.)** / **B conc. (%)**: 0-30 / 5-15
Flow rate	:	1.0 mL/min.	
Detection	:	UV 260 nm	

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Special HPLC Column > HPLC Column for Oligo DNA Analysis
https://labchem-wako.fujifilm.com/asia/category/01092.html

Wakopak Wakosil® GP-N6 for Deproteination/Direct Injection of Biological Samples

This product is a column that allows for the direct injection of biological samples, such as serum, that contain large amounts of protein. High-molecular-weight compounds such as proteins and sugars pass straight through the column due to the hydrophilic groups on the packing material, while relatively small molecules, such as drugs, are retained by reversed-phase interactions.

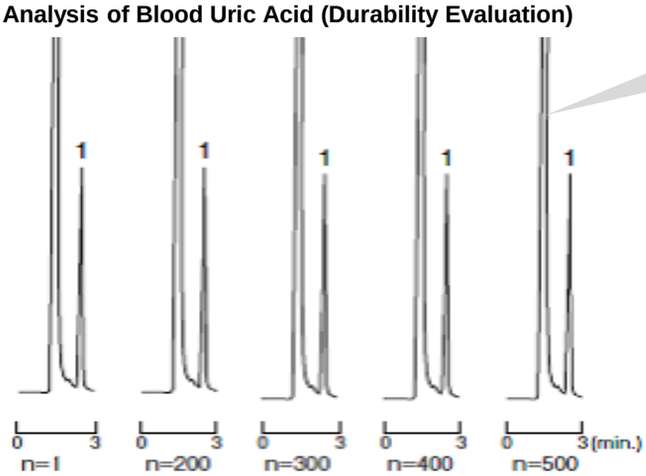
Wakosil® GP-N6	Conventional pretreatment
Approx. 5 min.	Approx. 1 h.
Serum	Serum
↓	↓ Protein precipitation
	↓ Centrifugation
	↓ Supernatant collection
	↓ Solvent distillation
	↓ Dissolution into mobile phase
	↓ Filtration with a 0.2 µm filter
	↓ Column injection

Features

- ✓ Capable of direct injection of biological samples
- ✓ Excellent durability
- ✓ Capable of analysis with high recovery rate and high reproducibility
- ✓ Capable of uses as a pretreatment column in column-switching methods

Analysis Example

Analysis of Blood Uric Acid (Durability Evaluation)



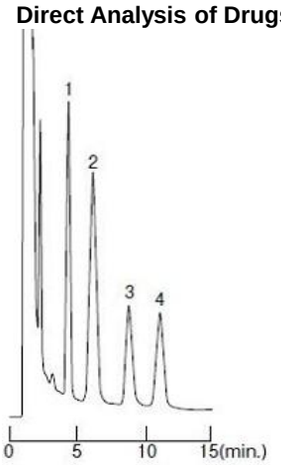
Even after 500 analyses using 5 µL of human serum, there was virtually no change in peak shape or retention time.

No.	Analyte
1	Uric Acid

Analysis condition

Column	:	Wakosil® GP-N6 4.6 mm × 150 mm
Column temperature	:	R.T.
Mobile phase	:	CH_3CN/0.2 M Na_2HPO_4 (pH 6.0) = 2/98 (v/v)
Flow rate	:	0.5 mL/min.
Detection	:	UV 284 nm

Direct Analysis of Drugs in Serum*



No.	Analyte	No.	Analyte
1	Acetaminophen 5 µg/mL	3	Ethenzamide 20 µg/mL
2	Sulfamethoxazole 5 µg/mL	4	Salicylamide 25 µg/mL

Analysis condition

Column	:	Wakosil® GP-N6 4.6 mm×150 mm
Column temperature	:	40°C
Mobile phase	:	CH_3OH/0.1 M Na_2HPO_4 (pH 6.0)=10/90 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm

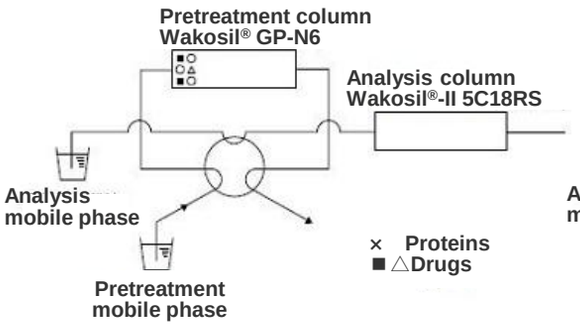
*Serum must be filtered through a 0.2 µm filter before injection.

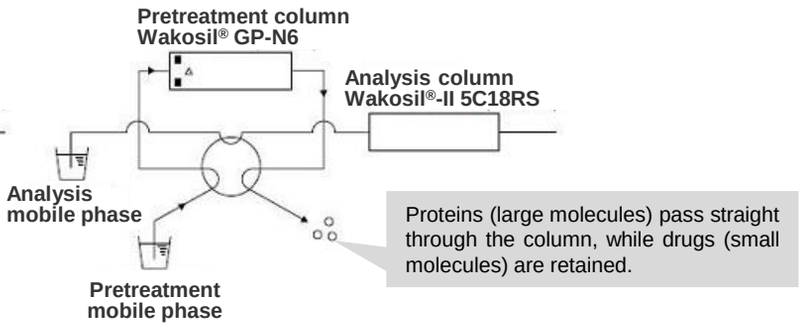
Column Switching Method

This product also can be used as a pretreatment column for column-switching method.

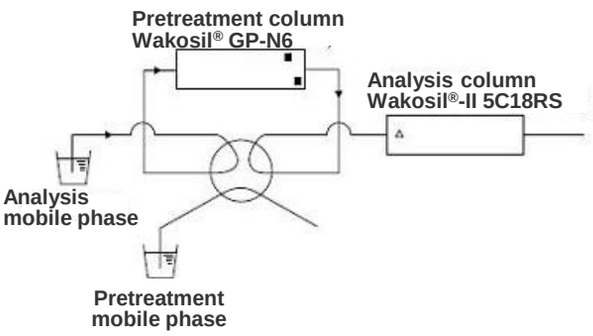
Instructions for Use

1. Use the pretreatment mobile phase to introduce serum, drugs, and other samples into the pretreatment column.

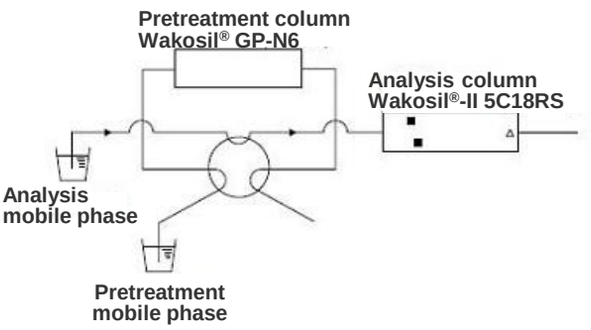




2. Switch the column flow path to direct the analysis mobile phase into the pretreatment column, transferring the drug and other substances from the pretreatment column to the analysis column.

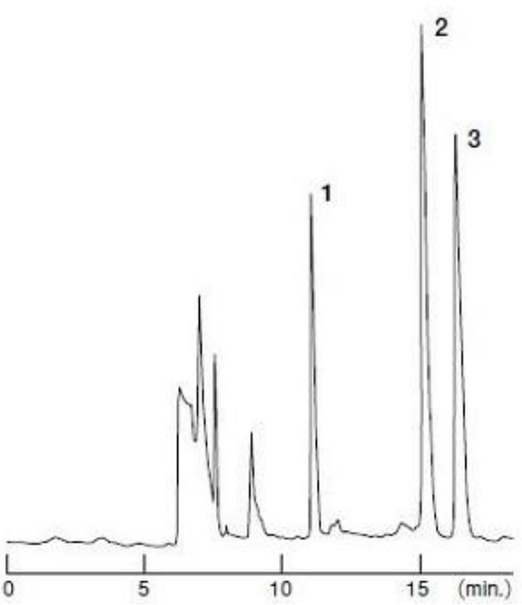


3. Switch the flow path again and analyze the drug and other substances using the analysis mobile phase.



Analysis Example

Analysis of Drug Contained in 20 µL of serum



No.	Analyte	No.	Analyte
1	Phenobarbital 20 µg/mL	3	Phenytoin 40 µg/mL
2	Carbamazepine 5 µg/mL		

Pretreatment condition

Column	:	Wakosil® GP-N6 4.6 mm × 50 mm
Column temperature	:	30°C
Mobile phase	:	CH_3CN/0.2 M NaH_2PO_4, Na_2HPO_4 (pH 6.0) = 2/98 (v/v)
Flow rate	:	1.0 mL/min.

Analysis condition

Column	:	Wakosil®-II 5C18RS 4.6 mm × 150 mm
Column temperature	:	30°C
Mobile phase	:	CH_3CN/0.1 M NaH_2PO_4, Na_2HPO_4 (pH 6.0) = 30/70 (v/v)
Flow rate	:	1.0 mL/min.
Detection	:	UV 254 nm
Column switching time	:	4.8-6.0 min.

Recovery rate

No.	Recovery rate (%)	CV (%)	No.	Recovery rate (%)	CV (%)	No.	Recovery rate (%)	CV (%)
1	99.3	1.06	2	96.5	1.12	3	102.3	0.78

Click here for details
TOP > Analytical Chemistry > Column for HPLC > Special HPLC Column > HPLC Column for Deproteination/Direct Injection of Biological Samples
https://labchem-wako.fujifilm.com/asia/category/01095.html

Wakopak Core C18 ADRA for ADRA

This column uses a Core Shell ODS packing material with a particle size of 2.6 µm, making it ideal for ADRA (OECD TG442C) analysis. ADRA (**A**mino Acid **D**erivative **R**eactivity **A**ssay) is an alternative to animal testing for evaluating the skin sensitizing potential of chemical substances. Skin sensitization occurs through covalent bonding between a sensitizing substance and the thiol group of cysteine or the amino group of lysine present in skin proteins. ADRA uses NAC (*N*-(2-(1-naphthyl)acetyl)-L-cysteine), a cysteine derivative, and NAL (α-*N*-(2-(1-naphthyl)acetyl)-L-lysine), a lysine derivative, in place of proteins, and predicts binding to proteins based on the reactivity of these compounds with the test substance. Reactivity is evaluated by reacting a solution of the test compound with a solution of NAC/NAL; the concentrations of the remaining NAC and NAL in the reaction mixture are then quantified by HPLC, and skin sensitization is assessed based on these results. The separation of NAC, NAL, and test compounds is verified for each column of this product.

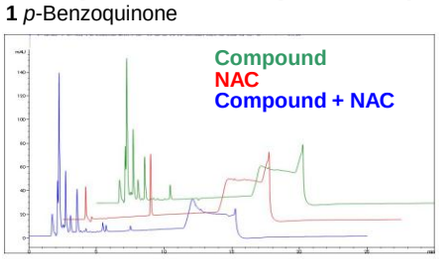
Features

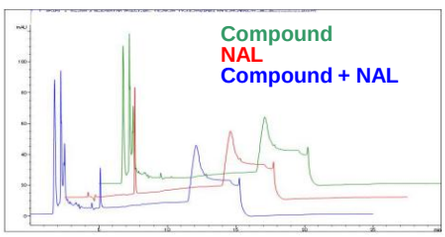
- ✓ Confirm separation of NAC, NAL, and test compounds for each column
- ✓ Attach the above results to the product as a Column Performance Report

Analysis Example

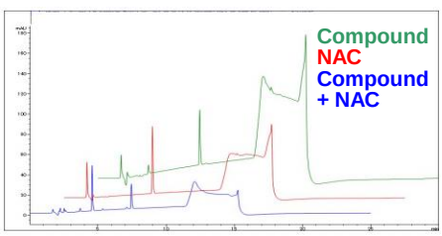
Analysis of Proficiency Test Compounds (Compounds Used to Verify Mastery of ADRA)

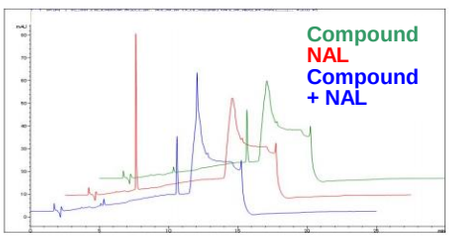
1 *p*-Benzoquinone



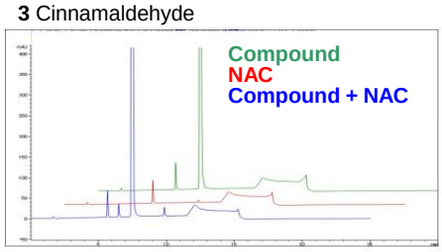


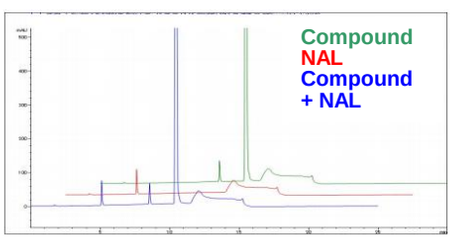
2 Sodium *p*-Toluenesulfonchloramide Trihydrate



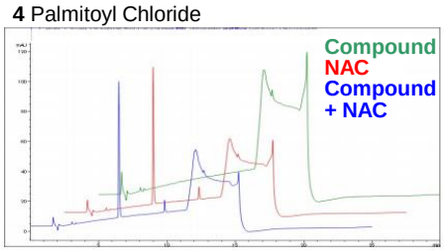


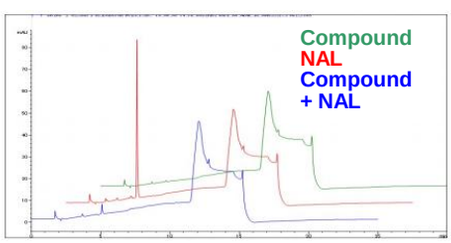
3 Cinnamaldehyde



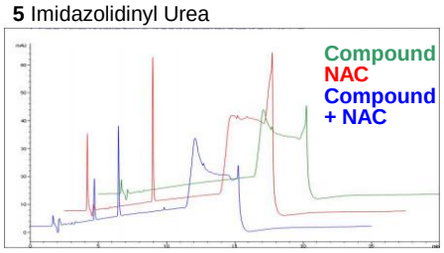


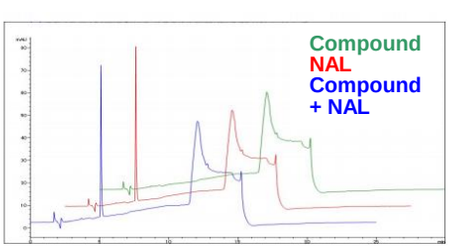
4 Palmitoyl Chloride



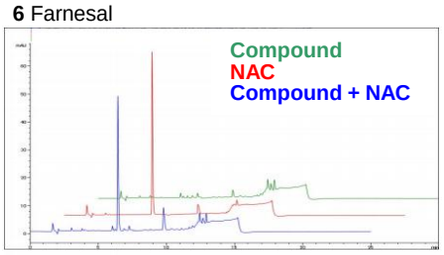


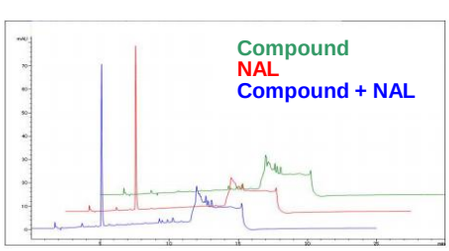
5 Imidazolidinyl Urea





6 Farnesal





Analysis condition

Column : Core C18 ADRA 3.0×150 mm
Colum temperature : 40°C
Mobile phase : A) H_2O, 0.1% TFA
B) CH_3CN, 0.1% TFA

NAC

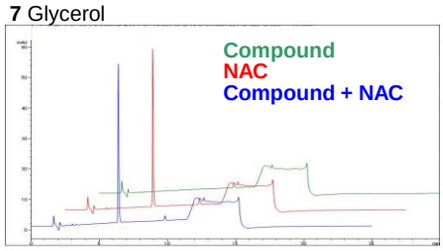
Time (min.)	B conc. (%)
0-9.5	30-55
9.5-10.0	55-100
10.0-13.0	100
13.0-13.5	100-30
13.5-25.0	30

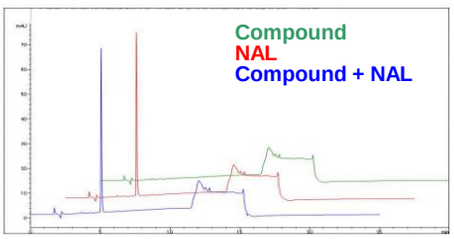
NAL

Time (min.)	B conc. (%)
0-9.5	20-45
9.5-10.0	45-100
10.0-13.0	100
13.0-13.5	100-20
13.5-25.0	20

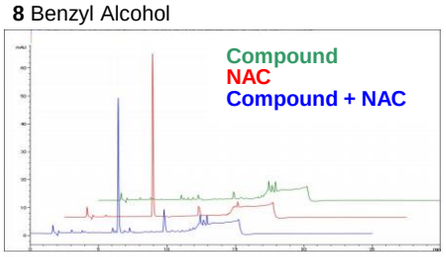
Flow rate : 0.3 mL/min.
Detection : UV 281 nm

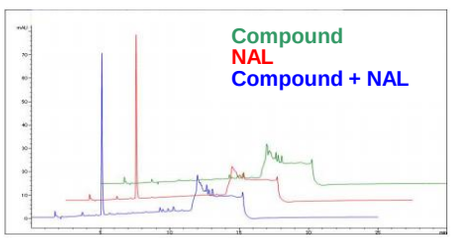
7 Glycerol



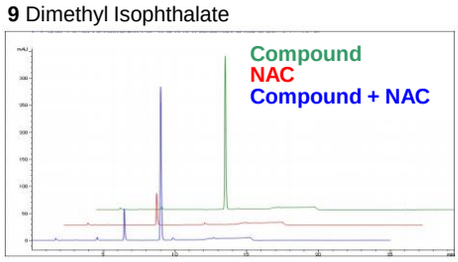


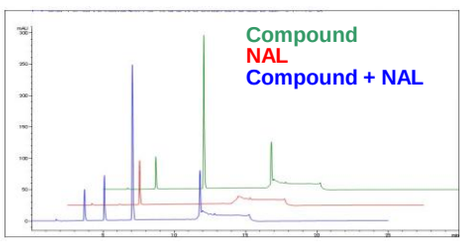
8 Benzyl Alcohol



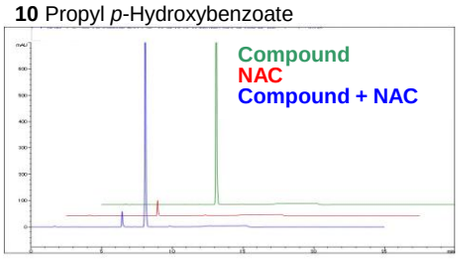


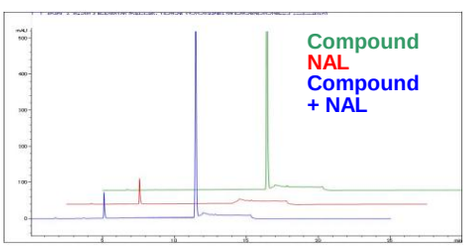
9 Dimethyl Isophthalate





10 Propyl *p*-Hydroxybenzoate





Rerated Products: ADRA Kit

This product is a reagent kit that simplifies the performance of ADRA.

Kit Contents

Components	Amount
NAC	2 vials × for 10 mL
NAL	2 vials × for 10 mL
NAC buffer (pH 8.0) premixed	2 vials × for 300 mL
NAL buffer (pH 10.2) premixed	2 vials × for 300 mL
0.01 mol/L EDTA solution	2 vials × 1 mL

Instructions for Use

Dissolve the buffer premix in water to prepare the solution. Next, dissolve the NAC and NAL, then allow the test compound to react with the solution in a 96-well plate for 24 hours before analyzing the sample via HPLC. The buffer premixed, NAC, and NAL are pre-portioned in the amounts required for the reaction and are ready for use in ADRA simply by dissolving them.

Code No.	Product Name	Grade	Volume
296-80901	ADRA Kit	for Skin Sensitisation Test	1 Kit

Click here for details
TOP > Pharma Manufacturing & QC > Drug Safety Test > Toxicity Test > ADRA Kit
https://labchem-wako.fujifilm.com/asia/category/01294.html

Analytical Method Validation Support

The Wakopak series includes a Wakopak Column Performance Report with each product, which guarantees the packing condition of each column to ensure quality.

Wakopak Column Performance Report

Contents

1. Number of theoretical plates *N* (Naphthalene)
2. Capacity Factor *α* (Naphthalene)
3. Separation Factor *k* (Naphthalene/Benzene)
4. Symmetry Factor *S* (10% height) (Naphthalene)

Wakopak Column Performance Report

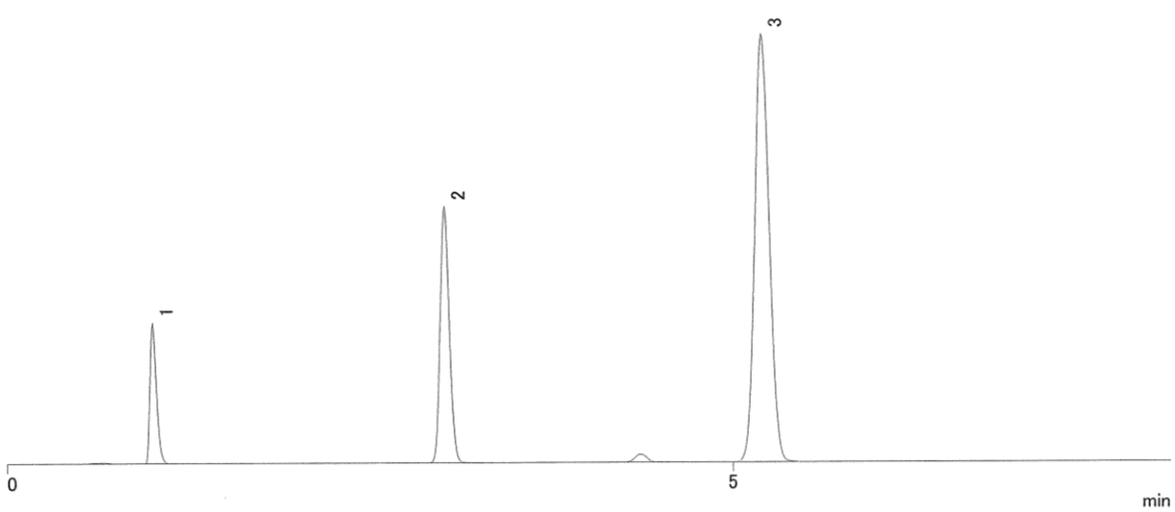
Date '22/01/18

Code No.	:	237-50363
Packing material	:	Wakosil-Ⅱ 3C18 HG (Lot No. 766)
Column size	:	4.6mm * 100mm(W)
Column No.	:	29564 (Lot No. WTR7661)
Packing Solvent	:	Acetonitrile/Water=60/40(V/V)

Test Condition for Standard Analy

Mobile phase	:	Acetonitrile/Water=60/40(V/V)
Flow Rate	:	1.0 ml/min
Temperature	:	R.T.
Pressure	:	6.3 MPa
Detector	:	UV 254 nm
Sample	:	1)Uracil 2)Benzene 3)Naphthalene

Test Chromatogram



Performance Result

ID#	Compound name	Retention time	③ k	② α
1	Uracil	1.013	--	--
2	Benzene	3.019	1.98	--
3	Naphthalene	5.206	4.14	2.09

①Theoretical plate of Naphthalene = 12721
④Symmetry factor of Naphthalene = 1.039

k=Capacity factor , α=Separation factor

Tested by Wako
Approved by Wako
Quality Control

FUJIFILM Wako Pure Chemical Corporation

Product List

Column Inner Diameter 2.0 - 4.0 mm

	Wakopak	Column Length (mm)										
		1.0×150	1.0×250	2.0×30	2.0×50	2.0×75	2.0×100	2.0×150	2.0×250	2.1×30	2.1×75	2.1×100
TMS	Wakosil® 5TMS	-	-	-	-	-	-	-	-	-	-	-
C4	Wakosil® 5C4	-	-	-	-	-	-	233-56703	230-56713	-	-	-
	Wakosil® 5C4-200	-	-	-	-	-	-	234-56951	-	-	-	-
C8	Wakosil® 3C8-100 HG	-	-	-	-	-	238-63267	-	-	-	-	-
	Wakosil®-II 3C8 RS	-	-	-	-	-	-	235-52243	-	-	-	-
	Wakosil® 5C8	-	-	-	-	-	-	234-56451	-	-	-	-
	Wakosil®-II 5C8 HG	-	-	235-61413	-	-	-	233-52423	230-52433	-	-	-
	Wakosil®-II 5C8 RS	-	237-52703	-	-	-	-	234-52713	-	-	-	-
C18	eco-ODS	-	-	-	-	-	-	-	-	-	-	-
	Handy ODS	-	-	-	-	-	-	-	-	-	-	-
	Navi C18-5	-	-	-	233-60353	-	-	234-60361	231-60371	-	-	-
	Ultra C18-2	-	-	-	-	-	-	-	-	230-64001	237-64011	234-64021
	Ultra C18-3	-	-	-	238-63561	235-63571	232-63581	239-63591	238-63821	-	-	-
	Ultra C18-5	-	-	-	235-63691	-	238-63701	231-02631	235-63711	-	-	-
	Wakosil®-II 3C18 AR	238-50033	-	235-59943	232-59953	-	-	232-50053		-	-	-
	Wakosil®-II 3C18 HG	233-50223	230-50233	233-59863	230-59873	-	-	231-50241	237-59883	-	-	-
	Wakosil®-II 3C18 RS	238-50413	235-50423	234-60023	231-60033	-	-	236-50431		-	-	-
	Wakosil® 5C18	-	239-53863	-	-	-	-	230-53871	237-53881	-	-	-
	Wakosil® 5C18N	-	-	-	-	-	-	234-54371		-	-	-
	Wakosil® 5C18T	-	-	-	-	-	-	-		-	-	-
	Wakosil® 5C18-200	-	-	-	-	-	-	-	231-55403	-	-	-
	Wakosil® 5C18-200N	-	-	-	-	-	-	-		-	-	-
	Wakosil® 5C18-200T	-	-	-	-	-	-	-		-	-	-
	Wakosil® 5C18 AR	-	-	-	-	-	-	233-54623	230-54633	-	-	-
	Wakosil®-II 5C18-100	-	237-51963	234-59653	-	-	-	238-51971	235-51981	-	-	-
	Wakosil®-II 5C18 AR	233-50603	-	237-59763	-	-	-	231-50621	234-50633	-	-	-
	Wakosil®-II 5C18 AR Prep	-	-	-	-	-	-			-	-	-
	Wakosil®-II 5C18 HG	233-50963	230-50973	232-59713	239-59723			231-50981	238-50991	-	-	-
	Wakosil®-II 5C18 HG Prep	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-II 5C18 RS	237-51321	230-51333	-	-	-	-	231-51341	238-51351	-	-	-
	Wakosil®-II 5C18 RS Prep	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 7C18	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 10C18	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 10C18-200	-	-	-	-	-	-	-	-	-	-	-
C22	Navi C22-5	-	-	-	-	-	-	232-60703	233-60711	-	-	-
	Wakosil®-II 5C22	-	-	-	-	-	-	-	236-53013	-	-	-
C30	Navi C30-5	234-61003	-	-	-	-	-	232-61043	239-61053	-	-	-
F	Fluofix®-II 120E	-	-	-	233-63393	-	-	236-63403	233-63413	-	-	-
Ph	Wakosil® 5Ph	-	-	-	-	-	-	-	-	-	-	-
CN	Wakosil® 5CN	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-II 5CN	-	-	-	230-61603	-	-	236-53591	235-53603	-	-	-
NH_2	Wakosil® 5NH_2	-	-	-	-	-	-	237-57563	234-57573	-	-	-
SIL	Wakosil® 5SIL	-	-	-	-	-	-	238-58051	231-58063	-	-	-
	Wakosil® 5SIL-120	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-II 5SIL Prep	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 7SIL-120	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 10SIL	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-II 5SIL-AQ	-	-	-	-	-	-	-	-	-	-	-
Diol	Wakosil® 5Diol-60	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 5Diol-120	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 5Diol-200	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 5Diol-300	-	-	-	-	-	-	-	-	-	-	-
Specialty	Combi ODS	-	-	-	233-59503	-	-	-	-	-	-	-
	Combi ODS fast	-	-	236-61823	-	-	-	-	-	-	-	-
	Combi CN	-	-	-	238-61763	-	-	-	-	-	-	-
	Core C18 ADRA	-	-	-	-	-	-	-	-	-	-	-
	Ultra APDS TAG®	-	-	-	-	-	-	-	-	-	-	235-64051
	Wakobeads-T-130-E	-	-	-	-	-	-	-	-	-	-	-
	Wakobeads-T-131-E	-	-	-	-	-	-	-	-	-	-	-
	Wakobeads-T-132-E	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® Agri-9	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-Cu	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® AS-Aqua	-	-	237-63911	-	-	-	237-63891	230-63901	-	-	-
	Wakosil® DNPH	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® DNPH-II	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-DNA	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® GP-N6	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-PAHs	-	-	230-59373	-	-	-	-	231-59381	-	-	-

Column Length (mm)													
3.0×30	3.0×50	3.0×75	3.0×100	3.0×150	3.0×250	4.0×10	4.0×30	4.0×50	4.0×100	4.0×150	4.0×200	4.0×250	4.0×300
-	-	-	-	-	-	-	-	-	-	-	-	239-57241	-
-	-	-	-	-	-	237-56723	-	-	-	235-56741	232-56751	-	236-56771
-	-	-	-	-	-	234-56973	-	-	-	232-56991	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	239-52263		-	237-52281	-	-	-	-	-	-
-	-	-	-	-	-	234-56473	235-56481	-	-	232-56491	235-56501	232-56511	-
-	-	-	-	-	-	235-52461	-	-	-	239-52481	236-52491	235-52503	-
-	-	-	-	238-52733	-	232-52753	239-52763	-	-	236-52773	-	230-52793	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
234-60383	-	-	-	231-60393	234-60403	231-60413	-	-	-	239-60431	-	233-60451	-
-	-	231-64031	238-64041	-	-	-	-	-	-	-	-	-	-
-	235-63831	-	238-63681	232-63841	239-63851	-	-	-	-	-	-	-	-
-	232-63721	-	239-63731	236-63741	233-63751	-	-	-	-	-	-	-	-
236-59973	-	239-50063	-	230-50071	-	-	-	233-50103	234-50111	237-50123	-	-	-
-	-	238-50251	-	235-50261	-	238-50273	239-50281	232-50293	239-50301	232-50313	-	-	-
-	-	-	-	230-50451	-	-	234-50471	237-50483	-	-	-	-	-
-	-	-	-	-	-	234-53891	-	-	-	234-53911	231-53921	238-53931	235-53941
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	235-54161	-	-	-
-	-	-	-	-	-	-	239-55421	-	-	236-55431	233-55441	230-55451	
-	-	-	-	-	-	-	-	-	-	236-55931	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	231-54641	-	-	-	231-54663	-	239-54681	
-	-	-	-	235-59683	-	-	239-52001	-	-	236-52011	233-52021	230-52031	233-52043
-	-	-	-	235-50641	232-50651	239-50661	232-50673	-	-	233-50681	230-50691	233-50701	236-50713
-	-	-	-	-	-	-	-	-	-	-	-	-	-
236-59733	-	-	-	235-51001	232-51011	239-51021	236-51031	-	-	233-51041	236-51053	237-51061	234-51071
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	235-51361	232-51371	239-51381	236-51391	-	-	239-51401	236-51411	233-51421	236-51433
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	234-54913	231-54923	232-54931	235-54943
-	-	-	-	-	-	-	238-55153	-	-	239-55161	236-55171	233-55181	230-55191
-	-	-	-	-	-	-	-	-	-	237-56181	-	237-56201	234-56211
-	-	-	-	-	230-60743	-	-	-	-	231-60773	-	235-60793	-
-	-	-	-	-	-	233-53023	234-53031	-	-	237-53043	234-53053	235-53061	-
-	-	-	-	233-61073	234-61081	-	-	-	-	237-61113	-	235-61131	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	231-57343	238-57353	239-57361	232-57373
-	-	-	-	-	-	-	-	-	-	231-57463	-	235-57483	-
-	-	-	-	-	-	-	-	-	-	-	230-53653	231-53661	-
-	-	-	-	238-63321	235-63331	235-57581	232-57591	-	-	235-57601	232-57611	239-57621	236-57631
-	-	-	-	-	-	232-58071	-	-	-	236-58091	235-58103	236-58111	-
-	-	-	-	-	-	-	-	-	-	-	239-58601	232-58613	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	238-58833	-	-	-	-	233-58861	230-58871
-	-	-	-	-	-	-	-	-	-	-	-	233-58361	236-58373
-	-	-	-	-	-	-	-	-	-	-	-	-	-
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-	-	-	-	233-63991	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-	-	-	-	-

Column Inner Diameter 4.6 - 50.0 mm

	Wakopak	Column Length (mm)										
		4.6×10	4.6×30	4.6×50	4.6×75	4.6×100	4.6×150	4.6×200	4.6×250	6.0×50	6.0×100	6.0×150
TMS	Wakosil® 5TMS	233-57261	-	-	-	233-57283	234-57291	-	234-57311	-	-	-
C4	Wakosil® 5C4	239-56783	-	-	-	239-56803	230-56811	233-56823	234-56831	-	-	-
	Wakosil® 5C4-200	236-57033	-	-	-	-	231-57061	-	235-57081	-	-	-
C8	Wakosil® 3C8-100 HG	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-II 3C8 RS	-	-	-	-	-	235-52363	-	-	-	-	-
	Wakosil® 5C8	-	233-56541	-	-	236-56553	237-56561	230-56573	231-56581	-	-	-
	Wakosil®-II 5C8 HG	233-52521	236-52533	-	-	237-52541	234-52551	237-52563	238-52571	-	-	238-52593
	Wakosil®-II 5C8 RS	230-52813	237-52823	-	-	234-52833	235-52841	-	239-52861	-	-	-
C18	eco-ODS	-	-	-	-	-	232-63363	-	-	-	-	-
	Handy ODS	-	-	-	-	-	237-50003	-	234-50013	-	-	-
	Navi C18-5	237-60471	234-60481	237-60493	-	234-60501	231-60511	234-60523	235-60531	-	-	236-60561
	Ultra C18-2	-	-	-	-	-	-	-	-	-	-	-
	Ultra C18-3	-	-	232-63863	238-63603	239-63873	235-63613	-	236-63883	-	-	-
	Ultra C18-5	-	-	236-63763	-	233-63773	235-02651	-	232-02661			
	Wakosil®-II 3C18 AR	238-50131	231-50143	232-50151	235-50163	236-50171	233-50181	-	230-60003	236-50193	-	230-50211
	Wakosil®-II 3C18 HG	233-50321	236-50333	237-50341	230-50353	231-50361	238-50371	-	235-59921	231-50383	238-50393	235-50401
	Wakosil®-II 3C18 RS	238-50511	235-50521	232-50531	235-50543	236-50551	233-50561	-	236-60083	-	-	234-50591
	Wakosil® 5C18	232-53951	239-53961	-	-	236-53971	233-53981	230-53991	237-54001	-	-	231-54021
	Wakosil® 5C18N	232-54453	233-54461	-	-	-	237-54481	-	237-54501	-	-	237-54523
	Wakosil® 5C18T	-	-	-	-	-	230-54231	233-54243	234-54251	-	-	-
	Wakosil® 5C18-200	234-55471	231-55481	-	-	234-55493	231-55501	238-55511	235-55521	-	-	-
	Wakosil® 5C18-200N	-	-	-	-	-	235-56001	-	239-56021	-	-	-
	Wakosil® 5C18-200T	-	-	-	-	-	238-55751	-	232-55771	-	-	-
	Wakosil® 5C18 AR	-	232-54713	-	-	239-54723	230-54731	237-54741	234-54751	-	-	238-54771
	Wakosil®-II 5C18-100	230-52053	-	-	-	238-52071	235-52081	232-52091	235-52101	-	-	-
	Wakosil®-II 5C18 AR	237-50721	234-50731	232-59791	-	231-50741	238-50751	231-50763	232-50771	-	-	236-50791
	Wakosil®-II 5C18 AR Prep	-	-	-	-	-	-	-	232-50891	-	-	-
	Wakosil®-II 5C18 HG	231-51081	238-51091	233-59743	-	231-51101	238-51111	235-51121	232-51131	235-51143	-	236-51151
	Wakosil®-II 5C18 HG Prep	-	-	-	-	-	-	-	232-51251	-	-	-
	Wakosil®-II 5C18 RS	237-51441	234-51451	-	-	231-51461	238-51471	235-51481	232-51491	-	-	230-51512
	Wakosil®-II 5C18 RS Prep	-	-	-	-	-	-	-	238-51611	-	-	-
	Wakosil® 7C18	-	-	-	-	-	237-54981	-	231-55001	-	-	-
	Wakosil® 10C18	239-55203	230-55211	-	-	237-55221	234-55231	237-55243	238-55251	-	-	-
	Wakosil® 10C18-200	-	-	-	-	-	238-56253	-	232-56273	-	-	-
C22	Navi C22-5	235-60813	232-60823	-	-	-	237-60851	-	231-60871	-	-	234-60903
	Wakosil®-II 5C22	-	232-53093	-	-	-	236-53111	233-53121	230-53131	-	-	230-53153
C30	Navi C30-5	235-61153	236-61161	233-61171	-	236-61183	237-61191	236-61203	237-61211	-	-	234-61243
F	Fluofix®-II 120E	-	231-63431	230-63423	-	-	233-63371	-	230-63381	-	-	-
Ph	Wakosil® 5Ph	239-57383	230-57391	-	-	-	230-57411	233-57423	234-57431	-	-	-
CN	Wakosil® 5CN	239-57501	-	-	-	-	230-57531	-	234-57551	-	-	-
	Wakosil®-II 5CN	-	-	-	-	-	232-53711	235-53723	236-53731	-	-	230-53751
NH_2	Wakosil® 5NH_2	233-57641	230-57651	-	-	233-57663	234-57671	231-57681	238-57691	-	-	234-57713
SIL	Wakosil® 5SIL	230-58131	237-58141	-	-	-	231-58161	234-58173	235-58181	232-58191	-	235-58201
	Wakosil® 5SIL-120	230-58631	233-58643	-	-	-	231-58661	234-58673	235-58681	-	-	-
	Wakosil®-II 5SIL Prep	-	-	-	-	-	-	-	239-53503	-	-	-
	Wakosil® 7SIL-120	-	-	-	-	-	-	-	234-58933	-	-	-
	Wakosil® 10SIL	-	-	-	-	-	-	-	-	-	-	-
	Wakosil®-II 5SIL-AQ	-	-	-	-	-	232-63461	-	239-63471	-	-	-
Diol	Wakosil® 5Diol-60	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 5Diol-120	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 5Diol-200	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® 5Diol-300	-	-	-	-	-	-	-	-	-	-	-
Specialty	Combi ODS	-	-	230-59513	-	-	-	-	-	-	-	-
	Combi ODS fast	-	237-61831	-	-	-	-	-	-	-	-	-
	Combi CN	-	-	236-61781	-	-	-	-	-	-	-	-
	Core C18 ADRA	-	-	-	-	-	-	-	-	-	-	-
	Ultra APDS TAG®	-	-	-	-	-	-	-	-	-	-	-
	Wakobeads-T-130-E	-	-	-	-	-	-	-	-	-	-	-
	Wakobeads-T-131-E	-	-	-	-	-	-	-	-	-	-	-
	Wakobeads-T-132-E	-	-	-	-	-	-	-	-	-	-	-
	Wakosil® Agri-9	-	237-61691	-	-	-	230-59351	-	237-59361	-	-	-
	Wakosil®-Cu	-	-	-	-	-	233-59341	-	-	-	-	-
	Wakosil® AS-Aqua	-	231-63931	-	-	-	234-63921	-	234-63281	-	-	-
	Wakosil® DNPH	-	-	-	-	-	-	-	238-59411	-	-	-
	Wakosil® DNPH-II	-	-	-	-	-	231-61731	-	-	-	-	-
	Wakosil®-DNA	-	-	-	-	-	239-59321	-	236-59331	-	-	-
	Wakosil® GP-N6	-	235-59421	232-59431	-	-	236-59451	-	230-59471	-	-	230-59493
	Wakosil®-PAHs	-	238-59391	-	-	-	-	-	231-59401	-	-	-

Column Length (mm)															
6.0×250	7.5×250	7.5×300	7.8×300	8.0×300	10×50	10×150	10×250	10×300	20×50	20×150	20×250	28×50	50×50	50×100	50×250
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	232-56913	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	233-57163	-	-	-	234-57193	-	-	-	-
-	-	-	-	-	-	-		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
234-56613	-	-	-	-	-	-	-	236-56673	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	237-52661	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	233-60613	-	230-60623	-	234-60643	-	231-60653	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	230-63783	-	237-63793	230-63803	237-63813	-	-	-	-
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
238-54031	232-54051	-	-	-	236-54071	-	233-54081	236-54093	233-54101	-	230-54111	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
236-55551	-	-	-	-	-	-	-	-	237-55623	-	-	-	-	-	-
236-56053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
235-55803	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	232-62187	232-54833	239-54843	-	-	-	-	-	-	-
-	-	233-52163	-	-	-	-	-	-	-	-	-	-	-	-	-
239-50801	-	236-50833	-	-	237-50841	-	234-50851	231-50861	234-50873	-	235-50881	-	-	-	-
-	-	-	-	-	-	-	239-60193	-	231-50903	-	238-50913	-	-	-	236-50953
233-51161	-	-	-	-	233-51203	-	230-51213	237-51223	238-51231	-	235-51241	-	-	-	-
-	-	-	-	-	230-60123	-	231-60131	-	239-51261	-	236-51271	-	231-60153	239-51303	236-51313
235-51523	239-51543	-	-	-	237-51561	-	234-51571	237-51583	238-51591	-	231-51601	-	-	-	-
-	-	-	-	-	-	-	-	234-60263	231-51623	-	232-51631	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	236-55311	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231-60913	-	-	-	-	-	-	236-60963	-	-	-	237-60993	-	-	-	-
237-53163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231-61253	-	-	-	-	239-61293	-	232-61303	-	-	-		-	-	-	-
-	-	-	-	-	-	234-63443	231-63453	-	-	-	-	-	-	-	-
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-	-	-	-	-	237-53803	-	234-53813	-	-	-	-	-	-	-	-
235-57721	-	236-57751	-	-	-	-	236-57773	233-57783	-	-	-	-	-	-	-
232-58211	-	239-58243	-	-	-	-	237-58261	230-58273	231-58281	-	238-58291	-	-	-	-
232-58711	-	239-58743	-	-	236-58753	-	233-58763	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	237-53521	-	-	-	231-53563
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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-	-	-	-	238-59553	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	235-59563	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	232-59573	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	239-59583	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	234-59533	-	-	231-59543	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	232-61803	-	-	239-61813	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	234-62083	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	231-62093	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	234-62103	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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-	237-61711	-	-	-	-	-	234-61721	-	-	-	-	-	-	-	-
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Listed products are intended for laboratory research use only, and not to be used for drug, food or human use. Please visit each region's website for product information. This leaflet may contain products that cannot be exported to your country due to regulations. Bulk quote requests for some products are welcomed. Please contact us.

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