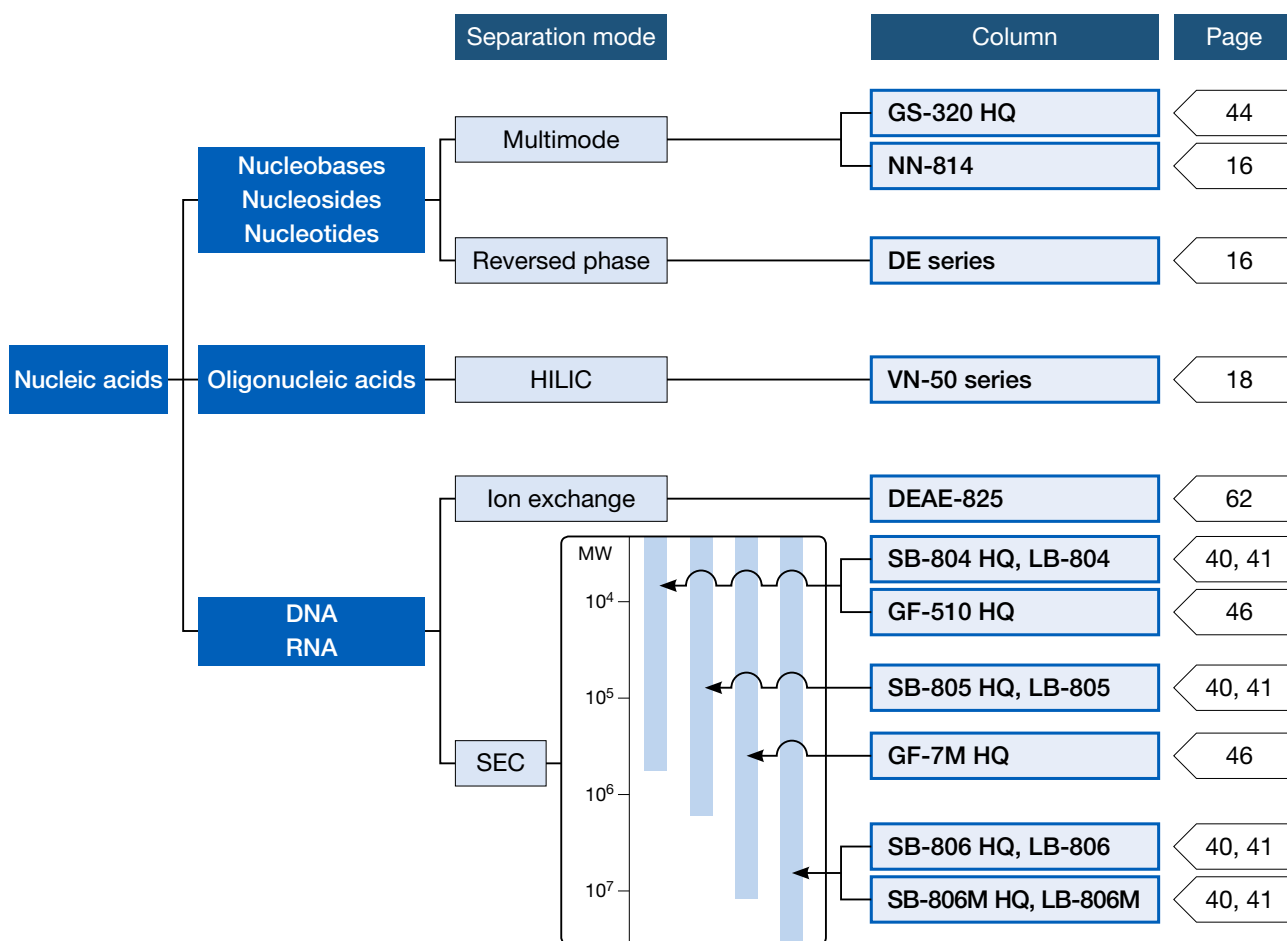


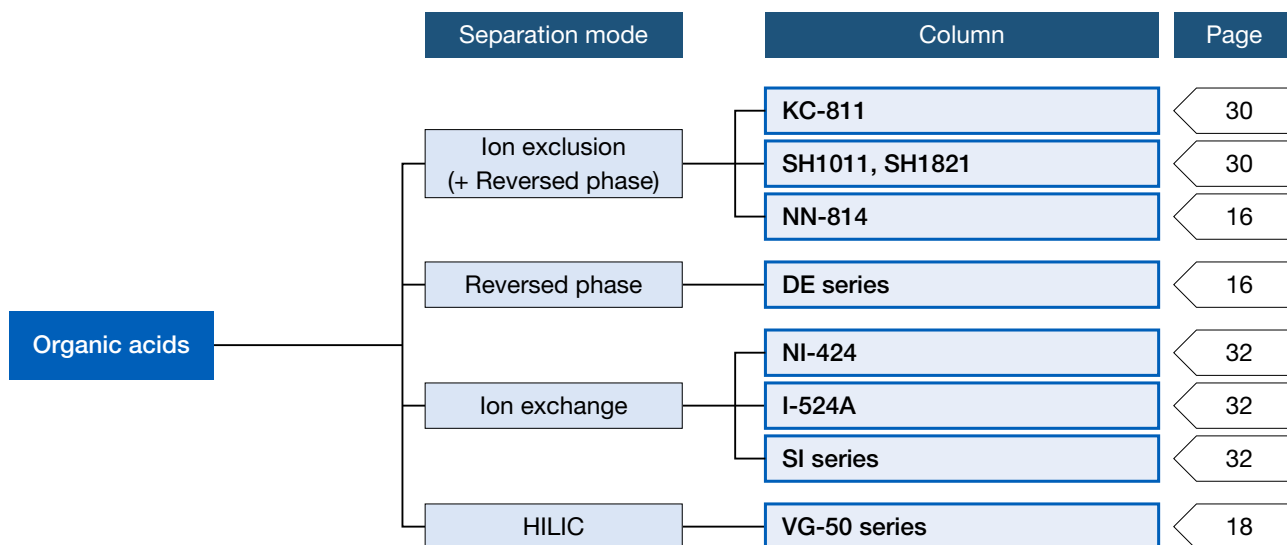
# Column Selection (Proteins, Peptides, and Amino Acids)

	Separation mode	Figure	Column	Page
Proteins Peptides	SEC		KW-802.5, KW402.5-4F	36
			LW-803, LW-403 4D	37
			KW-803, KW403-4F	36
			KW-804, KW404-4F	36
			KW405-4F	36
	Reversed phase		DE series	16
			ODP-50 series	14
			C4P-50 4D	14
	HILIC		VC-50 2D	18
			NH2P series	22
	Ion exchange		QA-825	62
			DEAE-825	62
			ES-502N 7C	62
			SP-825, SP-FT 4A	62
			CM-825	62
ES-502C 7C			62	
Multimode		GS-220 HQ	44	
		GS-320 HQ	44	
Amino acids	Ion exchange		NN-814	16
			YS-50	33
			P-421S	62
	Reversed phase		ODP-50 series	14
			VC-50 2D	18
	HILIC		VG-50 series	18
			NH2P series	22

## Column Selection (Nucleic Acids)



## Column Selection (Organic Acids)



# Column Selection (Drugs, Metabolites and Chiral Compounds)

	Separation mode	Column	Page	
Drugs Metabolites	Reversed phase	ODP2 HP	12	
		ODP-50 series, C4P-50 4D	14	
		DS-413, DS-613	16	
		DE series	16	
		C18M, C18U	24	
	HILIC	VC-50 2D	18	
		VT-50 2D	18	
		NH2P series	22	
	Ion exchange	NI-424	32	
		I-524A	32	
		YK-421	33	
		ES-502C 7C	62	
		Multimode	GS-320 HQ	44
	Chiral compounds	Chiral separation	CDBS-453	64

# Column Selection (Vitamins, Hormones / Neurotransmitters and Lipids)

	Separation mode	Column	Page
Water-soluble vitamins	Reversed phase	ODP-50 series	14
		DE series	16
		DM-614	16
		C18M, C18U	24
	HILIC	VG-50 series	18
		VT-50 2D	18
		NH2P series	22
Multimode	NN-814	16	
Fat-soluble vitamins	Reversed phase	ODP-50 series	14
		C18M, C18U	24
	SEC	KF-801, KF-401HQ	48, 52
Hormones / Neurotransmitters	Reversed phase	ODP-50 series	14
		DE series	16
		C18M, C18U	24
		SB-802.5 HQ, LB-802.5	40, 41
	HILIC	VC-50 2D	18
		VT-50 2D	18
		NH2P series	22
	Ion exchange	ES-502N 7C	62
		ES-502C 7C	62
Lipids	Reversed phase	ODP-50 series	14
		DS-413, DS-613	16
		DE series	16
	SEC	GF-310 HQ	46
		KF-801, KF-802, KF-802.5	48
		KF-402HQ	52

# Polymer-based Reversed Phase Chromatography Columns (RSpak)

<https://www.shodex.de/rspak-de-dm-ds-columns>

## Features

- DS-613**
  - Suitable for reversed phase analysis of highly hydrophilic substances that are not well retained by ODS columns
- DS-413**
  - Fulfill USP-NF L21 requirements
- DE-613**
  - General purpose polymer-based column having similar polarity as ODS columns
- DE-413**
  - Wide working pH range (from pH 2 to 12), usable in 100 % water and buffer solutions
- DE-213**
  - Fulfill USP-NF L71 requirements
- DM-614**
  - Suitable for the analysis of amino acids and water-soluble vitamins
  - Fulfills USP-NF L39 requirements
- NN-814**
  - The packing material modified with sulfo groups supports multimode (reversed phase and cation exchange) analysis
  - Ideal for the analysis of complex samples containing neutral and ionic substances
- JJ-50 2D**
  - The packing material is modified with trace amounts of quaternary ammonium groups, and supports multimode (reversed phase and anion exchange) analysis
  - Ideal for analysis of complex samples containing neutral and ionic substances

### DS

#### • Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Pore Size (Å)	Column Size (mm) I.D. x Length	Shipping Solvent
F7001001	<b>RSpak DS-613</b>	≥ 6,500	—	6	200	<b>6.0 x 150</b>	H <sub>2</sub> O/CH <sub>3</sub> CN/THF = 30/40/30
F6700140	<b>RSpak DS-G</b>	(guard column)	—	10	—	<b>4.6 x 10</b>	H <sub>2</sub> O/CH <sub>3</sub> CN/THF = 30/40/30
F7001012	<b>RSpak DS-413</b>	≥ 11,000	—	3.5	200	<b>4.6 x 150</b>	H <sub>2</sub> O/CH <sub>3</sub> CN/THF = 40/30/30

Base Material: Styrene divinylbenzene copolymer

### DE

#### • Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Pore Size (Å)	Column Size (mm) I.D. x Length	Shipping Solvent
F7001004	<b>RSpak DE-613</b>	≥ 7,000	—	6	25	<b>6.0 x 150</b>	H <sub>2</sub> O
F7001005	<b>RSpak DE-413</b>	≥ 11,000	—	4	25	<b>4.6 x 150</b>	H <sub>2</sub> O/CH <sub>3</sub> CN = 50/50
F6700150	<b>RSpak DE-G 4A</b>	(guard column)	—	10	—	<b>4.6 x 10</b>	H <sub>2</sub> O

Base Material: Polymethacrylate

#### • Semi-micro columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Pore Size (Å)	Column Size (mm) I.D. x Length	Shipping Solvent
F7001007	<b>RSpak DE-213</b>	≥ 8,000	—	4	25	<b>2.0 x 150</b>	H <sub>2</sub> O/CH <sub>3</sub> CN = 50/50
F6700151	<b>RSpak DE-G 2A</b>	(guard column)	—	6	—	<b>2.0 x 10</b>	H <sub>2</sub> O/CH <sub>3</sub> CN = 50/50

Base Material: Polymethacrylate

### DM

#### • Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Pore Size (Å)	Column Size (mm) I.D. x Length	Shipping Solvent
F7001002	<b>RSpak DM-614</b>	≥ 4,500	—	10	200	<b>6.0 x 150</b>	5 mM H <sub>3</sub> PO <sub>4</sub> aq.
F6700160	<b>RSpak DM-G 4A</b>	(guard column)	—	12	—	<b>4.6 x 10</b>	5 mM H <sub>3</sub> PO <sub>4</sub> aq.

Base Material: Polyhydroxymethacrylate

### NN

#### • Standard columns

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Pore Size (Å)	Column Size (mm) I.D. x Length	Shipping Solvent
F7008140	<b>RSpak NN-814</b>	≥ 9,000	Sulfo	10	200	<b>8.0 x 250</b>	0.1 M Sodium phosphate buffer (pH3.0)
F6700510	<b>RSpak NN-G</b>	(guard column)	Sulfo	10	—	<b>6.0 x 50</b>	0.1 M Sodium phosphate buffer (pH3.0)

Base Material: Polyhydroxymethacrylate

### JJ

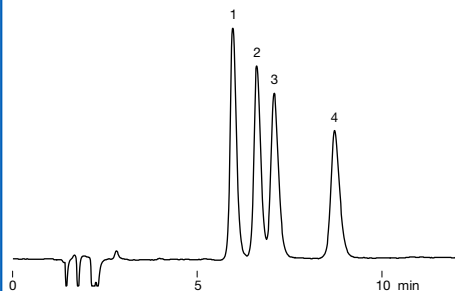
#### • Semi-micro column

Product Code	Product Name	Plate Number (TP/column)	Functional Group	Particle Size (µm)	Pore Size (Å)	Column Size (mm) I.D. x Length	Shipping Solvent
F7008220	<b>RSpak JJ-50 2D</b>	≥ 3,500	Quaternary ammonium	5	100	<b>2.0 x 150</b>	H <sub>2</sub> O/CH <sub>3</sub> CN = 40/60

Base Material: Polyvinyl alcohol

**Fatty acid methyl esters**

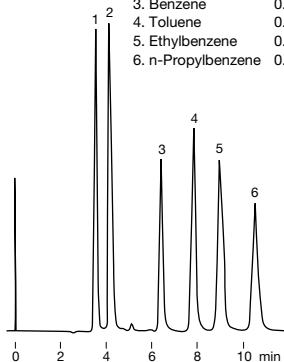
Sample : 0.2 % each, 20  $\mu$ L  
 1. Methyl linoleate  
 2. Methyl palmitate  
 3. Methyl oleate  
 4. Methyl stearate



**Column** : Shodex RSpak DS-413  
 Eluent : H<sub>2</sub>O/CH<sub>3</sub>CN/THF = 25/45/30  
 Flow rate : 1.0 mL/min  
 Detector : RI  
 Column temp. : 40 °C

**Alkylbenzenes**

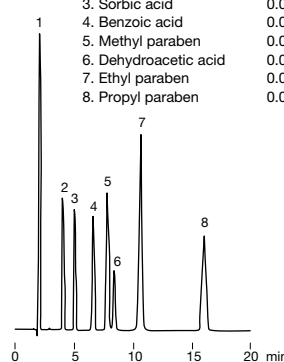
Sample : 5  $\mu$ L  
 1. m-Cresol 0.1 %  
 2. 2,4-Xylenol 0.1 %  
 3. Benzene 0.5 %  
 4. Toluene 0.5 %  
 5. Ethylbenzene 0.5 %  
 6. n-Propylbenzene 0.5 %



**Column** : Shodex RSpak DS-613  
 Eluent : H<sub>2</sub>O/CH<sub>3</sub>CN/THF = 30/40/30  
 Flow rate : 1.0 mL/min  
 Detector : UV (254 nm)  
 Column temp. : 40 °C

**Food additives (Preservatives)**

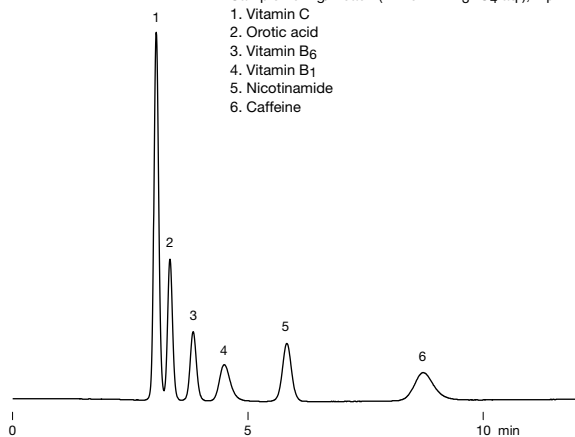
Sample : 10  $\mu$ L  
 1. Saccharin sodium 0.005 %  
 2. p-Hydroxybenzoic acid 0.005 %  
 3. Sorbic acid 0.02 %  
 4. Benzoic acid 0.02 %  
 5. Methyl paraben 0.01 %  
 6. Dehydroacetic acid 0.01 %  
 7. Ethyl paraben 0.02 %  
 8. Propyl paraben 0.02 %



**Column** : Shodex RSpak DE-413  
 Eluent : 50 mM KH<sub>2</sub>PO<sub>4</sub> + 0.1 % H<sub>3</sub>PO<sub>4</sub> aq./CH<sub>3</sub>CN = 65/35  
 Flow rate : 1.0 mL/min  
 Detector : UV (210 nm)  
 Column temp. : 40 °C

**Vitamins**

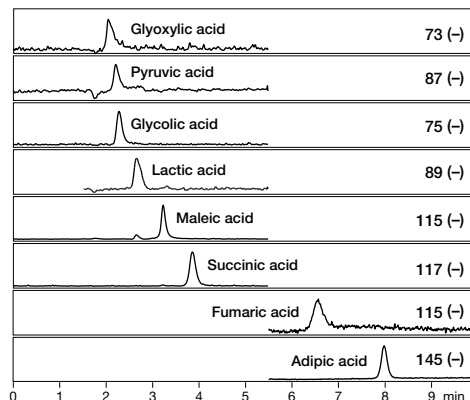
Sample : 5 mg/L each (in 2.5 mM H<sub>3</sub>PO<sub>4</sub> aq.), 4  $\mu$ L  
 1. Vitamin C  
 2. Orotic acid  
 3. Vitamin B<sub>6</sub>  
 4. Vitamin B<sub>1</sub>  
 5. Nicotinamide  
 6. Caffeine



**Column** : Shodex RSpak DM-614  
 Eluent : 0.055 M Na<sub>2</sub>HPO<sub>4</sub> + 0.045 M KH<sub>2</sub>PO<sub>4</sub> aq.  
 Flow rate : 1.0 mL/min  
 Detector : UV (254 nm)  
 Column temp. : 30 °C

**LC/MS analysis of organic acids**

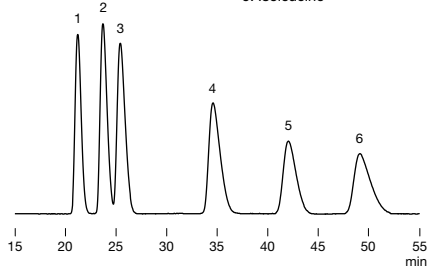
Sample : 50 ng/mL each, 10  $\mu$ L



**Column** : Shodex RSpak DE-213  
 Eluent : (A); 0.1 % (v/v) Formic acid aq./ (B); CH<sub>3</sub>CN  
 Linear gradient; 5 B % (0 to 2 min),  
 5 B % to 15 B % (2 to 2.5 min), 15 B % (2.5 to 10 min)  
 Flow rate : 0.2 mL/min  
 Detector : ESI-MS (SIM)  
 Column temp. : 30 °C

**Amino acids**

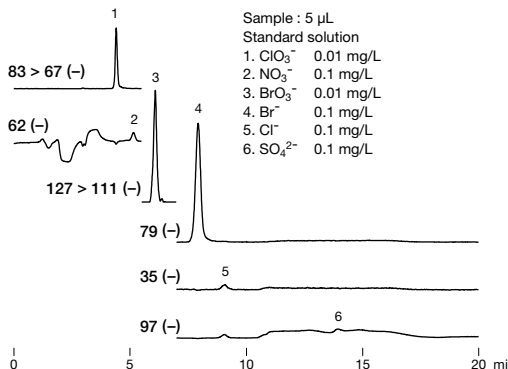
Sample : 0.1 % each, 20  $\mu$ L  
 1. Aspartic acid  
 2. Glycine  
 3. Alanine  
 4. Valine  
 5. Methionine  
 6. Isoleucine



**Column** : Shodex RSpak NN-814  
 Eluent : 40 mM H<sub>3</sub>PO<sub>4</sub> aq.  
 Flow rate : 1.0 mL/min  
 Detector : RI  
 Column temp. : 40 °C

**High sensitive analysis of chlorate and bromate by LC/MS/MS**

Sample : 5  $\mu$ L  
 Standard solution  
 1. ClO<sub>3</sub><sup>-</sup> 0.01 mg/L  
 2. NO<sub>3</sub><sup>-</sup> 0.1 mg/L  
 3. BrO<sub>3</sub><sup>-</sup> 0.01 mg/L  
 4. Br<sup>-</sup> 0.1 mg/L  
 5. Cl<sup>-</sup> 0.1 mg/L  
 6. SO<sub>4</sub><sup>2-</sup> 0.1 mg/L



**Column** : Shodex RSpak JJ-50 2D  
 Eluent : (A); 200 mM HCOONH<sub>4</sub> aq./ (B); CH<sub>3</sub>CN  
 Linear gradient (High pressure);  
 85 B % (0 to 8 min), 85 B % to 50 B % (8 to 9 min), 50 B % (9 to 14 min),  
 50 B % to 85 B % (14 to 15 min), 85 B % (15 to 20 min)  
 Flow rate : 0.3 mL/min  
 Detector : ESI-MS/MS (MRM) for ClO<sub>3</sub><sup>-</sup>, BrO<sub>3</sub><sup>-</sup>  
 ESI-MS (SIM) for NO<sub>3</sub><sup>-</sup>, Br<sup>-</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>  
 Column temp. : 50 °C