SHODEX™ CHROMATO NEWS JANUARY 2018

Shodex Singapore Team wishes You a Prosperous and Joyful year ahead. Happy New Year 2018! ★☆★☆

SHODEX makes Polymer-based HPLC columns, Are they listed in Pharmacopeia-related Monographs? 【・_・?】

A: **YES**. The United States Pharmacopeia (USP), European Pharmacopeia (EP) and Japanese Pharmacopeia (JP) have established standard guidelines for analysis and are used widely by regulatory agencies and industries throughout the world to ensure products are of appropriate qualities.

In this multi-page Special Edition, we will be bringing you a list of Shodex HPLC columns that may be suitable for analytical methods available in the above-mentioned Pharmacopeias, as well as examples of application data obtained with these specific types of columns. Examples include the analysis of Organic acids, Insulin Glargine, Mannitol, Dextrose and other sugars, Azithromycin, and more.

Shodex™

"Capture the Essence"

Polymer-based HPLC columns Made in Japan

More than 1000 variations of columns!

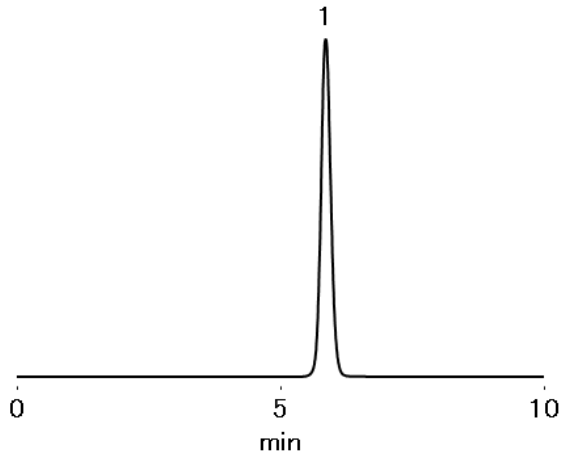
★ **Pharmaceuticals**
★ **Foods**
★ **Environment**
★ **New Material**

CONTACT US AT:
SHOWA DENKO SINGAPORE PTE LTD.
2 Shenton Way #15-03/04
SGX Centre 1,
Singapore 068804
Tel: +65-6223-1889
E-mail: sds-admi@sds.com.sg

Shodex Website:
www.shodex.com/en

Analysis of Ascorbic Acid Injection According to USP Method (DM-614)

According to USP 40 method, ascorbic acid should be analyzed using a column packed with L39. It is necessary for the system suitability to satisfy tailing factor of ≤ 1.6, the theoretical plate number of ≥ 3,500 and relative standard deviation (RSD) of ≤ 1.6%. It was confirmed that RSpak DM-614 satisfies all conditions for ascorbic acid analysis.



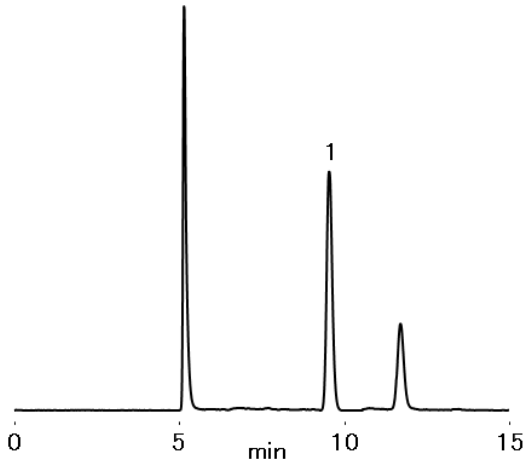
Sample : 4μL

1. Ascorbic acid 0.01%

```
Column       : Shodex RSpak DM-614 (6.0mmI.D. x
150mm)
Eluent       : 0.055M Na2HPO4 + 0.045M KH2PO4 aq.
(adjusted pH 2.5 with H3PO4)
Flow rate    : 0.6mL/min
Detector     : UV(245nm)
Column temp. : 30°C
```

Analysis of Formic Acid in Povidone According to JP Method (KC-811)

According to JP (Japanese Pharmacopoeia) method the analysis of formic acid in povidone, requires the system suitability to satisfy theoretical plate number of ≥ 1,000 and symmetry factor of 0.5 -1.5, and for the system repeatability to satisfy relative standard deviation (RSD) of ≤ 2.0% (repeated six times). It was confirmed that the all conditions were satisfied when formic acid was analyzed using RSpak KC-811.



Sample : 50μL

Standard solution

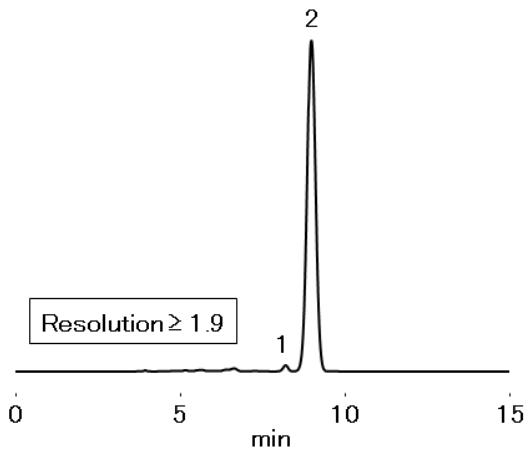
(Formic acid aq. 0.01mg/mL)

1. Formic acid

```
Column       : Shodex RSpak KC-811 (8.0mmI.D. x
300mm)
Eluent       : Diluted HClO4(70%) (1 in 700)
Flow rate    : 1.0mL/min
Detector     : UV(210nm)
Column temp. : 35°C
```

Analysis of Ribose According to USP Method (KS-801)

According to USP 39 method, ribose should be analyzed using a column packed with L22. It is necessary for the system suitability to satisfy resolution of ribose/arabinose of ≥ 1.2, tailing factor of ≤ 1.5, theoretical plate number of ≥ 2,500 and relative standard deviation (RSD) of ≤ 2.0%. It was confirmed that the all conditions were satisfied when SUGAR KS-801 was used for analysis.



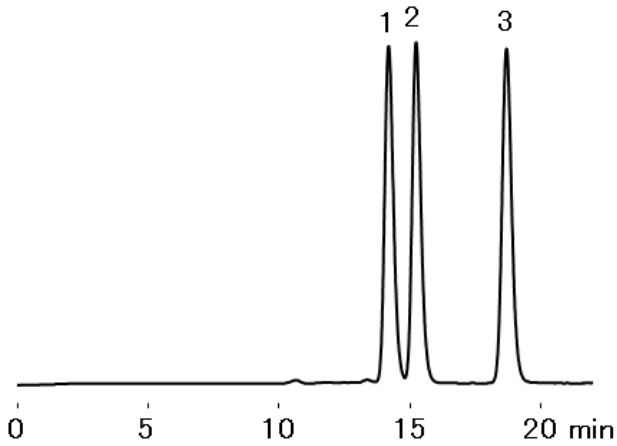
Sample : 10µL

1. Arabinose 0.02%
2. Ribose 2%

Column	:	Shodex SUGAR KS-801 (8.0mmI.D. x 300mm)
Eluent	:	H2O
Flow rate	:	1.0mL/min
Detector	:	Shodex RI
Column temp.	:	80°C

Analysis of Trehalose According to USP Method (KS-801)

According to USP 40 method, the assay of trehalose and the analysis of related substances in it should be analyzed using a column packed with L58. It is necessary for the system suitability to satisfy resolution (Rs) of trehalose and maltotriose of ≥ 1.5 and relative standard deviation (RSD) of peak area of trehalose ≤ 2.0%. It was confirmed that SUGAR KS-801 satisfies all conditions.



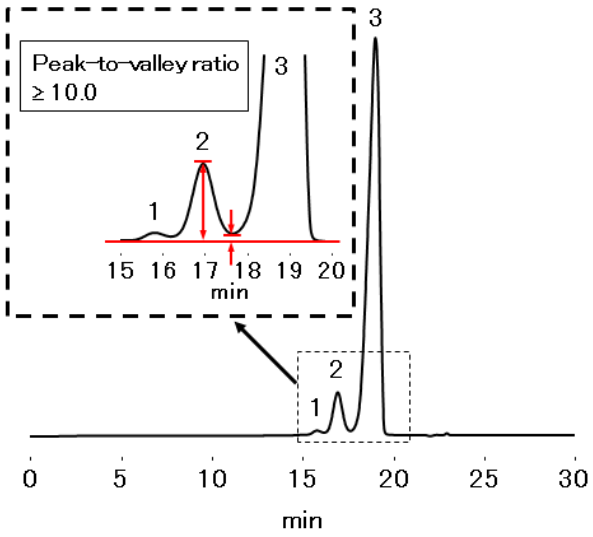
Sample : 0.25% each, 20µL

1. Maltotriose
2. Trehalose
3. Glucose

Column	:	Shodex SUGAR KS-801 (8.0mmI.D. x 300mm)
Eluent	:	H2O
Flow rate	:	0.4mL/min
Detector	:	Shodex RI
Column temp.	:	80℃

Analysis of Insulin According to USP Method (KW-802.5)

According to USP 39 method, high molecular weight proteins in insulin should be analyzed using a column packed with L20. It is necessary for the system suitability to satisfy retention times (between 13 and 17 min for the polymeric insulin complexes, about 17.5 min for the covalent insulin dimer, and between 18 and 22 min for the insulin monomer), and peak-to-valley ratio which is the ratio of the height of the covalent insulin dimer peak to the height of the valley between the covalent insulin dimer peak and the insulin monomer peak ≥ 2. It was confirmed that the all conditions were satisfied when they were analyzed using PROTEIN KW-802.5.



Sample : 100 µL

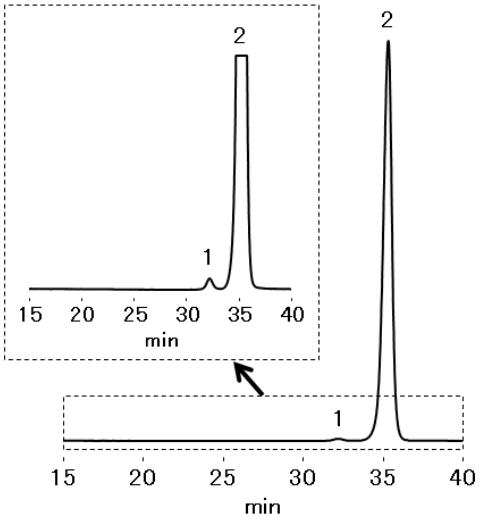
4.0mg/mL of Insulin (beef) containing dimer (in 0.01N HCl aq.)

1. High molecular weight proteins
2. Insulin dimer
3. Insulin monomer

```
Column        : Shodex PROTEIN KW-802.5
(8.0mmI.D. x 300mm)
Eluent        : 0.1wt% L-Arginine
aq./CH3CN/CH3COOH=13/4/3
Flow rate     : 0.5mL/min
Detector      : UV(276nm)
Column temp.  : 25°C
```

Analysis of Insulin Glargine According to USP Method (KW-802.5)

Insulin glargine is an analogue of human insulin and biosimilar of insulin. According to USP 39 method, insulin glargine should be analyzed using a column packed with L20. It is necessary for the system suitability to satisfy tailing factor for insulin glargine of ≤ 2.0 and *resolution ≥ 2. It was confirmed that the tailing factor was lower than 1.0, and insulin glargine and the high molecular weight proteins were completely separated when they were analyzed using PROTEIN KW-802.5.



Sample : 100µL

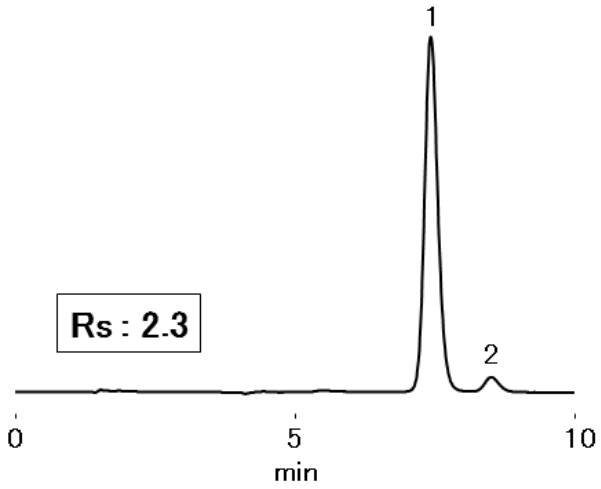
System suitability solution (prepared according to USP method)

1. High molecular weight proteins
2. Insulin glargine

```
Column        : Shodex PROTEIN KW-802.5 (8.0mmI.D. x
300mm) x 2
Eluent        : CH3COOH/CH3CN/H2O = 20/30/50 (pH to
3.0 adjusted with 25% NH3 aq.)
Flow rate     : 0.5mL/min
Detector      : UV(276nm)
Column temp.  : Ambient
```

Analysis of Zanamivir According to USP Method (NH2P-50 4E)

Zanamivir is a neuraminidase inhibitor and it is effective in the treatment of influenza caused by influenza A and B viruses. According to USP (United States Pharmacopeia) method, zanamivir should be analyzed using a column which can separate zanamivir and talo-zanamivir (internal standard) with resolution (Rs) of ≥ 1.5 and relative standard deviation (RSD) of ≤ 1.5%. It was confirmed that the all conditions were satisfied when zanamivir and talo-zanamivir were analyzed using Asahipak NH2P-50 4E.



Sample : 20µL

Zanamivir resolution solution

1. Zanamivir 0.05mg/mL

2. talo-Zanamivir 2.5µg/mL

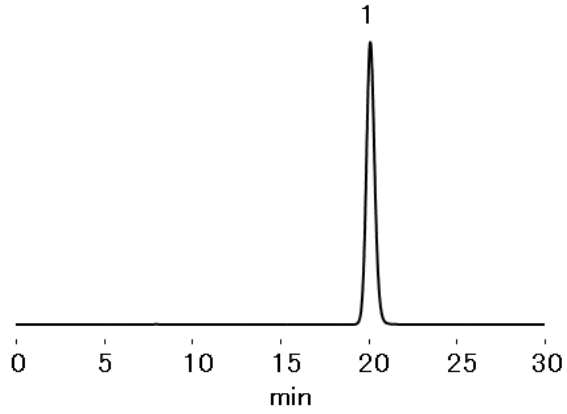
```
Column       : Shodex Asahipak NH2P-50 4E
(4.6mmI.D. x 250mm)
Eluent       : Acetonitrile and 7.5mM
sulfuric acid (60:40).
               Adjust with ammonia TS to a pH
of 6.2
Flow rate    : 1.5mL/min
Detector     : UV(234nm)
Column temp. : 30°C
```

Analysis of Voglibose According to JP Method (NH2P-50 4E)

According to JP (Japanese Pharmacopoeia) method, purity test of voglibose, it is necessary for the system suitability to satisfy theoretical plate number of ≥ 7,000 and symmetry factor of 0.8 -1.2, and for the system repeatability to satisfy relative standard deviation (RSD) of ≤ 3.0% (repeated six times). It was confirmed that the all conditions were satisfied when voglibose was analyzed using Asahipak NH2P-50 4E.

Sample : 10µg/mL, 50µL

1. Voglibose

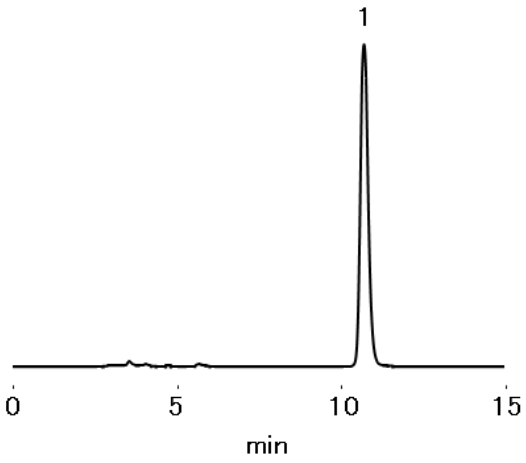



```
Column       : Shodex Asahipak NH2P-50 4E
(4.6mmI.D. x 250mm)
Eluent       : 20mM Sodium phosphate
buffer(pH6.5)/CH3CN=37/63
Reagent          : 12mM NaIO4 + 50mM Taurine
aq.
Flow rate    : (Eluent) 0.6mL/min (Reagent)
0.5mL/min
Detector     : Fluoresence(Ex. 350nm, Em.
430nm) (post-column reaction)
Column temp.   : 25°C
Reaction temp. : 100°C
```

*For column equilibration: First introduce 100mM Sodium phosphate buffer(pH6.5) at 0.5 mL/min for 2 hours, and then switch to the eluent at 0.5 mL/min for 2 hours.

Analysis of Miglitol According to JP Method (NH2P-50 4E)

The 17th edition of the JP (Japanese Pharmacopoeia) came into effect on April 1, 2016. Miglitol was added to the 17th edition of the JP. According to the JP method, it is necessary for the system suitability to satisfy theoretical plate number of ≥ 5,000 and symmetry factor of ≤ 1.5, and for the system repeatability to satisfy relative standard deviation (RSD) of ≤ 1.0% (repeated six times). It was confirmed that the all conditions were satisfied when miglitol was analyzed using Asahipak NH2P-50 4E.



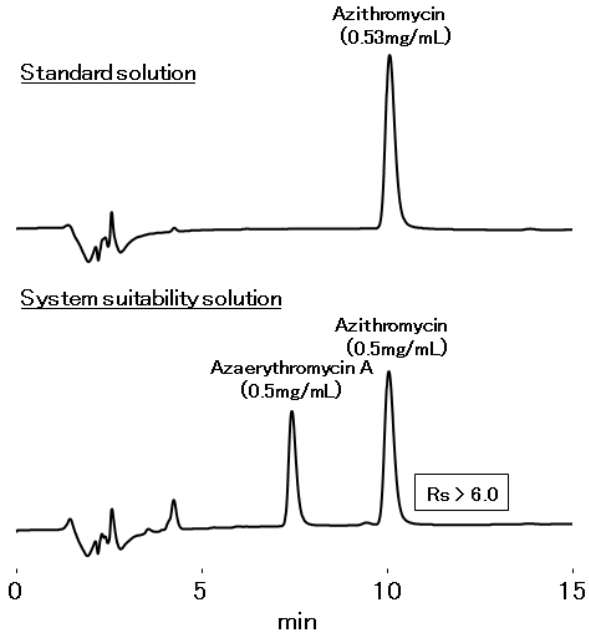
Sample : 20μL

1. Miglitol 1mg/mL

```
Column       : Shodex Asahipak NH2P-50 4E
(4.6mmI.D. x 250mm)
Eluent       : (4.5mM KH2PO4+0.47mM Na2HPO4
aq.)/CH3CN=25/75
Flow rate    : 0.7mL/min
Detector     : UV(210nm)
Column temp. : 35°C
```

Analysis of Azithromycin According to USP Method (ODP-50 4E)

Azithromycin is a 15-membered ring macrolide antibiotic. According to USP 39 method, azithromycin should be analyzed using a column packed with L67. It is necessary for the system suitability to satisfy resolution (Rs) between azithromycin and azaerythromycin of ≥ 3.0, tailing factor for azithromycin of 0.8 - 1.5 and relative standard deviation (RSD) of ≤ 1.1%. It was confirmed to satisfy all conditions when azithromycin and azaerythromycin were analyzed using Asahipak ODP-50 4E, which is suitable to be used under alkaline conditions (up to pH 13).



Sample : 10μL

Azithromycin

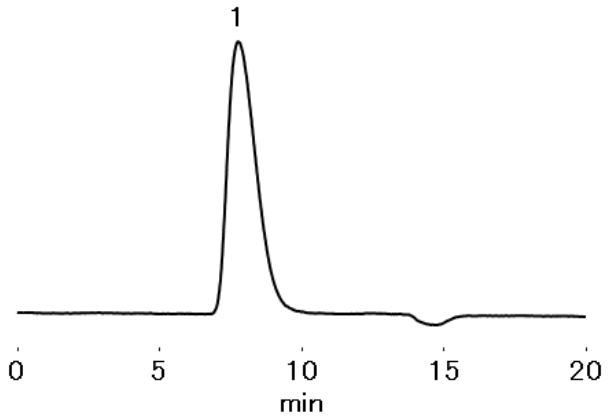
Azaerythromycin A

dissolved in 6.7g/L Dibasic potassium phosphate aq. (pH8.0 adjusted with phosphoric acid)/CH_3CN=40/60

```
Column       : Shodex Asahipak ODP-50 4E
(4.6mmI.D. x 250mm)
Eluent       : 6.7g/L Dibasic potassium
phosphate aq. (pH11.0 adjusted with 10M KOH)
               /CH3CN=40/60
Flow rate    : 1.0mL/min
Detector     : UV(210nm)
Column temp. : 40°C
```

Assay of Polyethylene Glycol 3350 According to USP Method (SB-802.5 HQ)

According to USP 40 method, the assay of polyethylene glycol 3350 in "Polyethylene Glycol 3350 and Electrolytes for Oral Solution" monograph should be analyzed using a column packed with L25. It is necessary for the system suitability to satisfy relative standard deviation (RSD) of ≤ 1.5%. It was confirmed that RSD was lower than 1.0% when polyethylene glycol 3350 was analyzed using OHpak SB-802.5 HQ.



Sample : 20µL

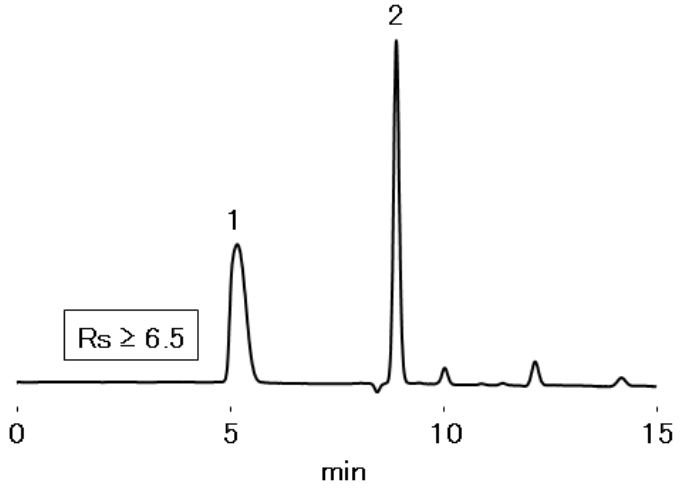
1. Polyethylene glycol 3350 0.72mg/mL

```
Columns      : Shodex OHpak SB-G 6B (6.0mmI.D. x
50mm) + SB-802.5 HQ (8.0mmI.D. x 300mm)
Eluent       : 14mg/L NaCl, 7.2mg/L KCl, 16mg/L
NaHCO3, 54.8mg/L Na2SO4
               and 35.2mg/L NH4Br in H2O
               (dilute 40.0mL of *Salt solution
with H2O to 1000mL)
Flow rate    : 1.0mL/min
Detector     : Shodex RI
Column temp. : Ambient

*Salt solution ; 0.35mg/mL NaCl, 0.18mg/mL KCl,
0.4mg/mL NaHCO3, 1.37mg/mL Na2SO4
                 and 0.88mg/mL NH4Br in H2O
```

Analysis of Purified Sodium Hyaluronate Ophthalmic Solution According to JP Method (SB-802.5 HQ)

The 17th edition of the JP (Japanese Pharmacopoeia) came into effect on April 1, 2016. Purified sodium hyaluronate ophthalmic solution was added to the 17th edition of the JP. According to the JP method, it is necessary for the system suitability to satisfy resolution (Rs) of Hyaluronic acid /ε-Aminocaproic acid of ≥ 5, and for the system repeatability to satisfy relative standard deviation (RSD) of ≤ 2.0% (repeated six times). It was confirmed that the all conditions were satisfied when OHpak SB-802.5 HQ was used for analysis.



Sample : 20µL

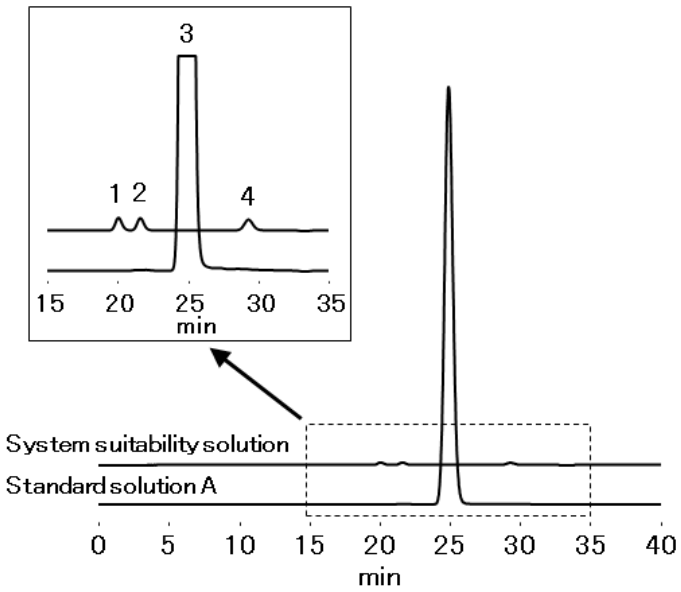
System suitability solution (prepared according to JP method)

1. Hyaluronic acid
2. ε-Aminocaproic acid

```
Column       : Shodex OHpak SB-802.5 HQ
(8.0mmI.D. x 300mm)
Eluent       : 0.1M Na2SO4 aq.
Flow rate    : 1.0mL/min
Detector     : UV(210nm)
Column temp. : 40°C
```

Analysis of Dextrose According to USP Method (SC1011)

According to USP 40 method, the assay of dextrose (D-glucose) and the analysis of related substances in it should be analyzed using a column packed with L19. It is necessary for the system suitability to satisfy resolution (Rs) between maltotriose and maltose of ≥ 1.3. It was confirmed to satisfy the system suitability when sample solution A was analyzed using SUGAR SC1011.



Sample : 20μL

System suitability solution : Maltotriose, Maltose, Fructose 1mg/mL each (in H_2O)

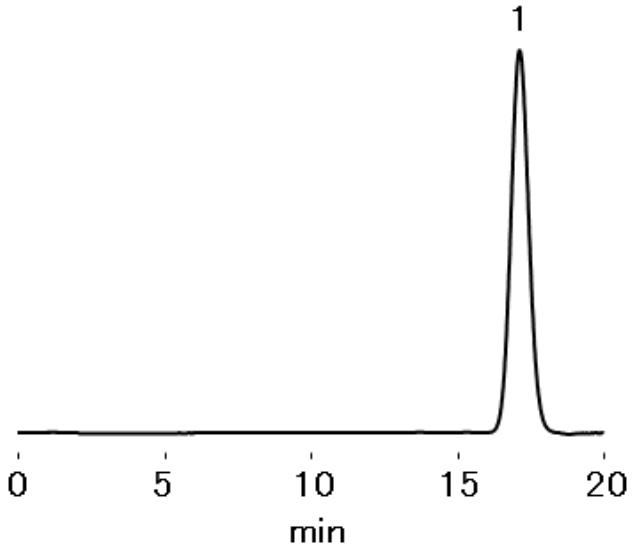
Sample solution A : Dextrose (D-Glucose) 30mg/mL(in H_2O)

1. Maltotriose, 2. Maltose, 3. Dextrose, 4. Fructose

```
Column        : Shodex SUGAR SC1011
(8.0mmI.D. x 300mm)
Eluent        : H2O
Flow rate     : 0.3mL/min
Detector      : Shodex RI
Column temp.  : 85°C
```

Analysis of Tagatose According to USP Method (SC1011)

According to USP 40 method, the assay of tagatose should be used a column packed with L22. It is necessary for the system suitability to satisfy relative standard deviation (RSD) of ≤ 2.0%. It was confirmed to satisfy the system suitability when tagatose was analyzed using SUGAR SC1011.



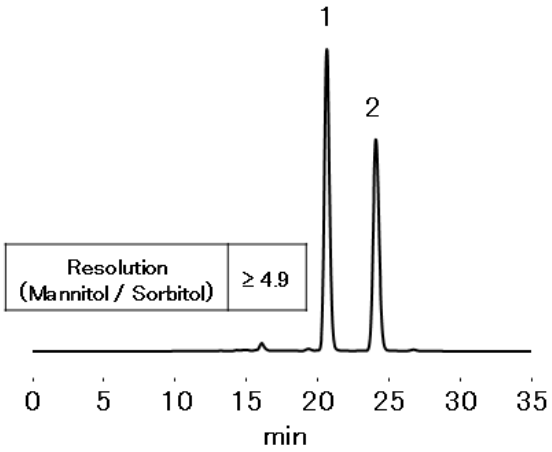
Sample : 20μL

1. Tagatose 5mg/mL

```
Column        : Shodex SUGAR SC1011
(8.0mmI.D. x 300mm)
Eluent        : 0.05mg/mL Calcium acetate aq.
Flow rate     : 0.6mL/min
Detector      : Shodex RI
Column temp.  : 85°C
```

Analysis of Mannitol According to Pharmacopeia Method (SC1011-7F)

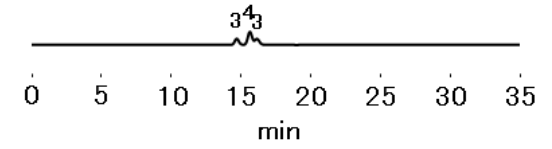
Analytical conditions of mannitol for United States Pharmacopeia (USP) were partially changed in USP 37-NF 32 operated on December 1st, 2014. Now USP, European Pharmacopeia (EP) and Japanese Pharmacopeia (JP) request the column whose resolution between mannitol and sorbitol is more than 2.0. EP SC1011-7F is suitable under the method of these pharmacopeias.



Sample : 25mg/mL each, 20μL

1. Mannitol
2. Sorbitol

```
Column          : Shodex EP SC1011-7F
(7.8mmI.D. x 300mm)
Eluent          : H2O
Flow rate       : 0.5mL/min
Detector        : Shodex RI
Column temp.    : 85°C
```

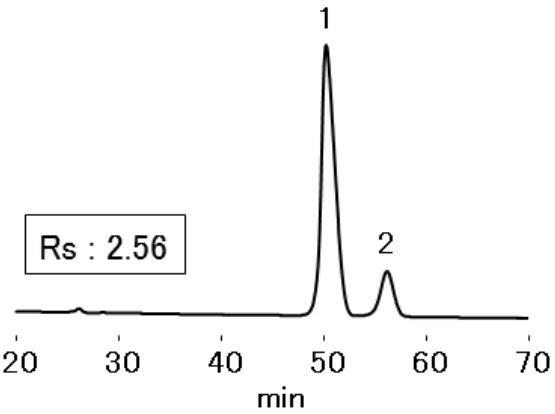


Sample : 1mg/mL each, 20μL

3. Isomalt (= Palatinit)
4. Maltitol

Analysis of Xylitol According to USP Method (SP0810)

According to USP method (United States Pharmacopeia), xylitol should be analyzed using a column which can separate xylitol and galactitol (internal standard) with resolution(Rs) of ≥ 2.0 and relative standard deviation (RSD) of ≤ 2%. It was confirmed that Rs was higher than 2.0 and RSD was lower than 2% when xylitol and galactitol were analyzed using SUGAR SP0810.



Sample : 25μL

1. Xylitol 25mg/mL
2. Galactitol 2.5mg/mL

```
Column          : Shodex SUGAR SP0810 (8.0mmI.D. x
300mm)
Eluent          : H2O/CH3CN=80/20
Flow rate       : 0.5mL/min
Detector        : UV (192nm)
Column temp.    : 80°C
```

Analysis of Guar Gum According to USP Method (SP0810)

Guar gum is known to carry out physiological effects such as suppressing the rise in blood sugar level, cholesterol-lowering effect, as well as others. In USP, the quantification of galactomannan, and ratio of constituting mannose and galactose is defined. According to USP method, a column packed with L22 should be used and it is necessary for the system suitability to satisfy the following. It was confirmed that the all conditions were satisfied when analyzed using SUGAR SP0810, a column for sugar analysis.

System suitability

1. Resolution (System suitability solution)

between Dextrose (= Glucose) and Xylose	≥ 0.9
between Xylose and Galactose	≥ 1.0
between Galactose and Mannose	≥ 1.5

2. Tailing factor (Standard solution)

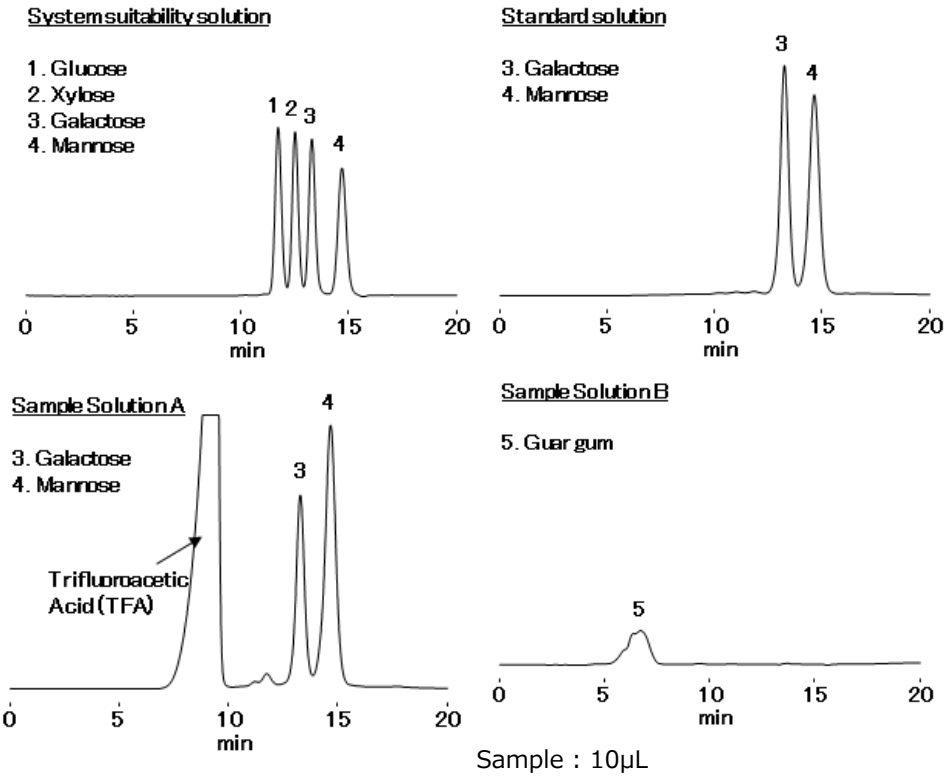
Galactose and Mannose peaks	0.8-1.8

3. Relative standard deviation (Standard solution)

Galactose and Mannose peaks	≤ 2.0% (repeated six times)

Sample Solution A : Guar gum is dissolved in TFA aq. Mannose and glucose are produced as a result of hydrolysis of galactomannan by acids. The content of galactomannan and ratio of constituting mannose and galactose from the quantitative values of mannose and galactose in the portion of guar gum taken were calculated.

Sample Solution B : Guar gum is dissolved in the eluent. No presence of galactose and mannose peaks are observed in the chromatogram of Standard solution B.



System suitability solution: Glucose, Xylose, Galactose, Mannose 5mg/mL each (in H_2O)
Standard solution: Galactose, Mannose 10 mg/mL each (in H_2O)
Sample Solution A: Guar gum 25mg/mL (prepared according to USP method)
Sample Solution B: Guar gum 5mg/mL (in eluent)

```
Column       : Shodex SUGAR
SP0810 (8.0mmI.D. x 300mm)
Eluent       : H2O
Flow rate    : 0.75mL/min
Detector     : Shodex RI
Column temp. : 80℃
```

Sample : 10μL

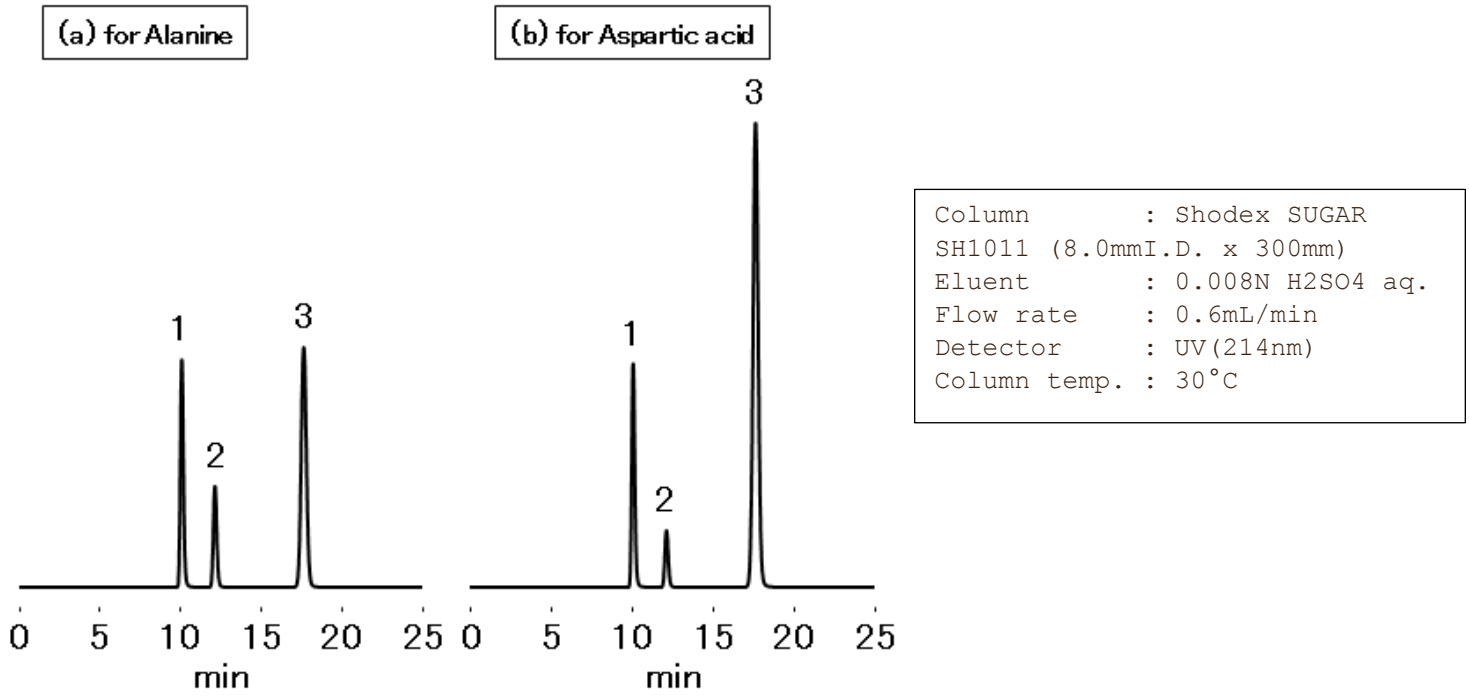
Analysis of Related Compounds of Alanine and Aspartic Acid According to USP Method (SH1011)

According to USP 40 method, related compounds (organic acids) of alanine and aspartic acid should be analyzed using a column packed with L17. The system must have suitable resolution between maleic acid and malic acid, and each relative standard deviation of maleic acid, malic acid and fumaric acid (repeated six times). All conditions were satisfied when analyzed using SUGAR SH1011.

(Notice) Alanine and aspartic acid cannot elute under this analysis condition.

System suitability

	Resolution (Maleic acid / Malic acid)	**Relative standard deviation (RSD) (each of Maleic acid, Malic acid and Fumaric acid)**
Alanine	≥ 1.5	≤ 5.0%
Aspartic acid	≥ 1.5	≤ 10.0%



Sample : 10µL

(a) System suitability solution for Alanine

1. Maleic acid 0.05mg/mL
2. Malic acid 3mg/mL
3. Fumaric acid 0.05mg/mL

(b) System suitability solution for Asparatic acid

1. Maleic acid 0.05mg/mL
2. Malic acid 1.5mg/mL
3. Fumaric acid 0.1mg/mL

No.	Compound Name	Type of Test	PF	USP Packing	Shodex Equivalent
1	ALANINE	Related compounds	40(2)	L17	SUGAR SH1011
2	ALBUMIN HUMAN	Molecular weight distribution and average molecular weight	41(6)	L59	PROTEIN LW-803
3	ALPHA-LACTALBUMIN	Assay and Limit of alphalactalbumin	34(2)	L33	PROTEIN LW-803
4	AMYLENE HYDRATE	Assay	17(1)	L19	SUGAR SC1011
5	ANTITHROMBIN III HUMAN	Molecular weight distribution, Average molecular weight	30(1)	L59	PROTEIN LW-803
6	ASCORBIC ACID INJECTION	Assay	23(2)	L39	RSpak DM-614
7	ASPARTIC ACID	Related compounds	40(4)	L17	SUGAR SH1011
8	AZITHROMYCIN	Assay	39(6)	L67	Asahipak ODP-50 4E
9	AZITHROMYCIN FOR INJECTION	Assay & Related Compounds	34(3)	L67	Asahipak ODP-50 4E
10	BETADEX SULFOBUTYL ETHER SODIUM	Assay	36(2)	L37	OHpak SB-803 HQ
11	CHITOSAN	Molecular weight distribution and average molecular weight	35(1)	L38	OHpak SB-803 + SB-805 + SB-806 HQ
12	DALTEPARIN SODIUM	Identification	40(5)	L59	PROTEIN KW-802.5 + KW-803 + KW-G
13	DEXTRAN 40	Molecular weight distribution, Average molecular weight	23(4)	L38	OHpak SB-803 + OHpak SB-805 x2
14	DEXTRAN 70	Molecular weight distribution, Average molecular weight	23(4)	L38	OHpak SB-803 + OHpak SB-805 x2
15	DEXTROSE	Assay and Related Compounds	0(0)	L19	SUGAR SC1011
16	DEXTROSE EXCIPIENT	Assay, Identification, and Related Compounds	42(6)	L19	SUGAR SC1011
17	EPINEPHRINE INJECTION	Enantiomeric Purity and Identification	43(3)	L45	ORpak CDBS-453
18	EPOETIN	Limit of High Molecular Weight Proteins	41(5)	L20	PROTEIN LW-803
19	EPTACOG ALFA ACTIVATED	Assay and Organic Impurities	41(3)	L59	PROTEIN LW-803
20	ERYTHRITOL	Assay and Related Compounds	31(5)	L17	SUGAR SH1011
21	ETHYLCELLULOSE DISPERSION TYPE B	Assay and Content of Ethylcellulose	36(6)	L21	GPC KF-801
22	EXENATIDE INJECTION	Assay and Identification	43(5)	L20	PROTEIN KW-802.5
23	EXTENDED INSULIN HUMAN ZINC SUSPENSION	Limit of High Molecular Weight Proteins	18(6)	L20	PROTEIN KW-802.5

No.	Compound Name	Type of Test	PF	USP Packing	Shodex Equivalent
24	FILGRASTIM	Limit of High Molecular Weight Proteins	36(5)	L59	PROTEIN LW-803
25	FORMOTEROL FUMARATE	Limit of Formoterol Related Compound	33(3)	L67	Asahipak ODP-50 4D
26	FUMARIC ACID	Limit of Maleic Acid	13(1)	L17	SUGAR SH1011
27	GUAR GUM	Content of Galactomannans and Ratio of Constituting Mannose and Galactose.	41(2)	L22	SUGAR SP0810
28	HEPARIN SODIUM	Molecular weight determinations	0(0)	L59	PROTEIN LW-803 + KW-804
29	HEPARIN SODIUM IN DEXTROSE INJECTION	Assay for Dextrose	18(6)	L19	SUGAR SC1011
30	HIGH FRUCTOSE CORN SYRUP	Assay	26(5)	L19	SUGAR SC1011
31	HYDROGENATED STARCH HYDROLYSATE	Assay and Content of maltitol and sorbitol.	35(1)	L58	SUGAR KS-801
32	INOSITOL	Assay, Identification, and Related Compounds	33(4)	L19	SUGAR SC1011
33	INSULIN	Limit of High Molecular Weight Proteins	30(5)	L20	PROTEIN KW-802.5
34	INSULIN ASPART	Limit of High Molecular Weight Proteins	39(3)	L20	PROTEIN KW-802.5
35	INSULIN GLARGINE	Limit of High Molecular Weight Proteins	39(4)	L20	PROTEIN KW-802.5
36	INSULIN HUMAN	Limit of High Molecular Weight Proteins	18(6)	L20	PROTEIN KW-802.5
37	INTERFERON BETA-1A	Analysis of N-Linked Oligosaccharides and Quantitation of Biantennary Sialylation.	41(3)	L82	Asahipak NH2P-50 4D
38	ISOMALT	Assay and Related Compounds	31(1)	L19	EP SC1011-7F
39	LACTITOL	Assay and Related Compounds	23(6)	L34	SUGAR SP0810
40	MALIC ACID	Limit of fumaric and maleic acids.	14(3)	L17	SUGAR SH1011
41	MALTOSE	Assay	29(4)	L58	SUGAR KS-801
42	MANNITOL	Assay	17(3)	L19	EP SC1011-7F
43	NATEGLINIDE	Assay and Limit of nateglinide related compound C and phenylalanine	34(6)	L71	RSpak DE-613
44	OMEGA-3 ACIDS ETHYL ESTERS	Test for Oligomers	0(0)	L21	GPC KF-801
45	POLYETHYLENE GLYCOL 3350	Assay	39(6)	L25	OHpak SB-802.5

No.	Compound Name	Type of Test	PF	USP Packing	Shodex Equivalent
46	POVIDONE	Impurity Test - Formic Acid in Povidone	0(0)	L17	RSpak KC-811
47	RIBAVIRIN CAPSULES	Dissolution	38(3)	L17	IC Y-521
48	RIBOSE	Assay and Related Compounds	41(2)	L22	SUGAR KS-801
49	TAGATOSE	Assay	30(5)	L19	SUGAR SC1011
50	XYLITOL	Assay, Identification and Limit of other polyols	37(4)	L34	SUGAR SP0810
51	ZANAMIVIR	Assay and Organic Impurities	38(6)	L82	Asahipak NH2P-50 4E

About Shodex™:

Shodex™ is a brand name of High Performance Liquid Chromatography (HPLC) columns produced by Showa Denko K.K. (Japan) since 1973. With our selection of over 1000 different HPLC columns with a wide range of separation modes, we are confident that we have a suitable column for your analytical needs. Shodex™ is best known for innovative polymer-based columns offering size-exclusion chromatography, HILIC, and sugar analysis columns. Website: http://www.shodex.com/en/

About Showa Denko Singapore Pte Ltd.:

Showa Denko Singapore Pte Ltd. is a 100% subsidiary of Showa Denko K.K. (SDK) which is headquartered in Tokyo, Japan. We provide sales and technical services for a wide variety of products produced by the Showa Denko Group. Since its establishment in 1981, Showa Denko Singapore has been the trade focal point for the Showa Denko group in the South-East Asia, South Asia and Oceania regions.
Website: http://www.sds.com.sg/

About Showa Denko K.K.:

Formed in 1939, SDK manufactures chemical products and industrial materials. SDK's products serve a wide array of fields ranging from heavy industry to the electronic and computer industries. SDK has more than 180 subsidiaries and affiliates around the world.
Website: http://www.sdk.co.jp/english/

Shodex™

Contact Information:

Showa Denko Singapore Pte Ltd
(South-East Asia, South Asia & Oceania)
2 Shenton Way #15-03/04
SGX Centre 1 Singapore 068804
Tel: +65-6223-1889
E-mail: sds-admi@sds.com.sg