Shodex OHpak SB-2000 series

1. Introduction

The packed columns of Shodex OHpak SB-2000 series are designed to be used for semi-preparative GPC of water-soluble polymers.

2. Specifications

Column type	Exclusion limit (Pullulan)	Theoretical plate number
SB-2002	4,000	8000<
SB-2002.5	10,000	10000<
SB-2003	100,000	10000<
SB-2004	400,000	10000<
SB-2005	4,000,000	10000<
SB-2006	(20,000,000)*	10000<
SB-2006M	(20,000,000)*	10000<

* : Figures in parenthese are estimated values.

Column material : SUS-316
Column size : 20 x 300mm
Endfitting : Internally-threaded type, No.10-32 UNF
Packing material: Porous hydrophilic polyhydroxymethacrylate gel
In-column solvent: 0.02% Sodium azide aqueous solution

Column type	Usable pressure (kgf/cm^2)	Usable flow rate (ml/min)	Recommended flow rate (ml/min)
SB-2002	Max. 25	Max. 5	3
SB-2002.5	Max. 25	Max. 6	3
SB-2003	Max. 25	Max. 6	3
SB-2004	Max. 25	Max. 6	3
SB-2005	Max. 25	Max. 6	3
SB-2006	Max. 25	Max. 5	3
SB-2006M	Max. 25	Max. 5	3

Column type	Usable temperature ℃	Usable pH	Usable salt concentration	Usable polar organic solvent
SB-2002	15-60	3-10	Max. 0.5M	0%
SB-2002.5	15-60	3-10	Max. 0.5M	Max. 60%
SB-2003	15-60	3-10	Max. 0.5M	Max. 50%
SB-2004	15-60	3-10	Max. 0.5M	Max. 50%
SB-2005	15-60	3-10	Max. 0.5M	Max. 50%
SB-2006	15-60	3-10	Max. 0.5M	Max. 50%
SB-2006M	15-60	3-10	Max. 0.5M	Max. 50%

3. Eluent

The separation performance of SB-2000 series will be largely affected by the eluent conditions.

0.1M $NaNO_3$ aqueous solution, a buffer, an organic solvent or a mixture of buffer and organic solvent can be used as an eluent. Among them, 0.1M $NaNO_3$ aqueous solution is most commonly used as an eluent.

The followings are buffers and organic solvents usually used.

1) Buffer

(1) Phosphate buffer

Caution:

① The buffer pH range should be between 3 and 10.

② When a salt is added, the salt concentration should be lower than 0.5 mole/L.

③ When an eluent whose salt concentration is more than 0.2 mole/L is used, flow rate should be lower than 3 ml/min.

④ A salt containing chloric ion should not be added because it corrodes metallic parts. Even when it is essential to add it, the time used with it should be shorter than 8 hours and pH range should be within the range higher than 4.

⑤ Do not use an eluent which contains boric acid or borate, because borate makes a complex with diol group of packing material.

2) Organic solvent

(1) Acetonitrile

(2) Methyl alcohol

Caution: ① When an organic solvent is added to an eluent, the eluent viscosity will become higher. Consequently, the column pressure will also become higher. Therefore, be careful

that maximum pressure will not exceed 25kgf/cm^2.

② When an eluent whose organic solvent concentration is more than 30% with SB-2003, SB-2004, SB-2005, SB-2006 and SB-2006M, flow rate should be lower than 3 ml/min.

4. Preparation of eluent

1) Remove extraneous or insoluble matters by passing the eluent through a 0.45 μm filter.
2) Thoroughly degas the eluent, by ultrasonic vibration and simultaneous heating or pressure reduction with an aspirator.
Use of solvent degassing device, Shodex DEGAS KT series is recommended.

5. Installation and start-up

1) Prior to connection of the column to the liquid chromatograph, replace the solvent in the chromatograph with the solvent to be used as the eluent.
When a solvent containing salt is remaining in the chromatograph, wash all flow line with purified water before replacement with the eluent.
When a solvent containing organic solvent such as chloroform is remaining in the chromatograph, wash all flow line with acetone before replacing with the eluent.

2) After replacing the solvent in the chromatograph, set the flow rate at half of the flow rate to be used.

Caution: It is recommended to start from a slow flow rate to check column pressure does not exceed the maximum pressure.

3) Connect the column to the chromatograph as that the arrow mark on the column will face downstream. Do not let air get into the column while connecting the column to the chromatogram.
Then, start pumping.

Caution: After confirming that the column pressure does not exceed the maximum pressure, the flow rate can be raised at the flow rate to be used.

6. Pre-treatment of sample

1) The sample should be dissolved in the eluent to be used.
2) Remove extraneous or insoluble matters by passing the sample through a 0.45 μm filter.
   Use of the disposable filter unit, Shodex DT series is recommended.

7. Guard column

Install a guard column just upstream of the main column to protect it from contamination by the sample.
The guard column is intended to maintain the main column performance as designed for a long period of time and not to improve resolving power.

8. Safekeeping

1) When the column is heated, after completing analysis, keep pumping the eluent at a low flow rate until the column is cooled down to room temperature.
2) Stop the pump and leave the column in the chromatograph, if it is to be used on the following day.
3) In case of 3 or more days of suspension of chromatograph in which a solvent containing salt was used as the eluent, replace the eluent with purified water, setting the flow rate at 0.5ml/min.
4) In case of its suspension over one week, take the same action of as in 3) above use 0.02% sodium azide aqueous solution instead of purified water and dismount the column from chromatograph.
   Then, blank off both ends of the column.

9. Troubleshooting

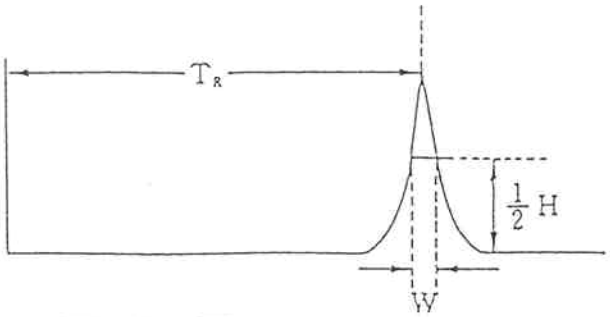
Table 1 below gives troubles likely to occur during use of the column and the corrective actions to be taken. It is not guaranteed that the corrective actions given in the table always solve the trouble. Therefore, after taking the actions, check the column resolution. Please note that removal of the endfittings will allow the air or other insoluble matters to enter the column, probably to deteriorate the column performance.

Trouble	Cause	Corrective action
Column pressure increase	Plugged endfitting	Reverse the column on the chromatograph and pass the eluent through it for one hour.
	Inclusion of insoluble matters in the column	Irreparable
Rapid deterioration of resolution	Void induced in the upstream end of the column or channel induced in the column	Irreparable
	Liquid flow disturbance caused by insoluble matters clogging endfitting.	Reverse the column on the chromatograph and pass the eluent through it for one hour.
	Adsorption of some impurity of sample or eluent on packing materials	Pass acidic or alkaline buffer into the column at 0.5ml/min for one hour.
No sample elution	Sample adsorption	Change the separation conditions
	Malfunctioning detector	Check the detector

10. Measurement of theoretical plate number(N)

The measurement conditions for N determination are described in attached inspection sheet.

Calculation of N



$N = 5.54(T_R/W)^2$
$N = NTP$
T_R = Retention time (min)
W = Half width (min)

11. Warranty

1) Showa Denko shall replace any Shodex column,

1-1) If found damaged at the time of delivery.

1-2) If theoretical plate number(N) obtained by the purchase as per the operation manual is significantly smaller than the one given in the inspection sheet attached to the column.

Claims must be filed with Showa Denko within 10 days following delivery.

2) The following shall not be subject to warranty.

2-1) Service life

2-2) Deterioration of column performance resulting from improper handling.