Operation Manual
Shodex HILICpak VG-50 2D

(Please read this operation manual carefully to achieve the best and consistent column performance for a long time.)

Important Handling Instructions

Caution!

· Please consult the Safety Data Sheet (SDS) of reagents and solvents used with the column and understand their proper handling methods to prevent potential health hazards or death from occurring.

· Please wear appropriate personal protective equipment such as lab goggles and gloves when handling organic solvents and acid and alkaline reagents. Avoid any direct physical contact to prevent chemical injuries.

Before Using the Column

(1) Please visually inspect the column package and the column surface for any damage.

(2) Please check the product name and serial number (Serial no. or S/N) written on the column package and adhesive label on the column body.

(3) Please download the Certificate of Analysis (CoA) for the purchased product. The CoA can be downloaded from Shodex website (https://www.shodex.com/download/). You will be asked to enter the serial number.

1. Introduction

Thank you for purchasing the Shodex product. Shodex HILICpak VG-50 2D is a polymer-based hydrophilic chromatography (HILIC) chlromatography column modified with amino group. It is suitable for separation and analysis of sugars and sugar alcohols.

2. Column Components

Please refer to the Shodex website: https://www.shodex.com/en/da/07.html

3. Column Specifications

Product Code	Product Name	Column Size (mm)		Particle Size (μm)	Theoretical Plate Number (Per Column)
		I.D.	Length		
F7630300	**HILICpak VG-50 2D**	2.0	150	5	≥ 3,500
F6711200	**HILICpak VG-50G 2A**	2.0	10	5	(Guard Column)

Base Material : Spherical porous particles of polyvinyl alcohol modified with amino group
Column Housing : PEEK
Screw Type : Internally-threaded type No.10-32 UNF
Shipping Solvent : Water/Acetonitrile = 15/85

4. Usable Conditions

Product Name	Flow Rate (mL/min)		Maximum Pressure (MPa/column)	pH Range	Temperature Range (°C)
	Recommended	Maximum			
HILICpak VG-50 2D	0.1 - 0.2	0.45	15	2 - 13	4 - 60
HILICpak VG-50G 2A	-	-	-		

Usable solvents are listed below.

(1) A mixture of water and acetonitrile or water and methanol of any ratio can be used. Up to 100 % water, acetonitrile, and methanol can be used. Use of organic solvents other than acetonitrile or methanol is not warrantied.

(2) Buffers and aqueous solutions of different salts can be used instead of water. Usable buffers include phosphate and acetate. Usable aqueous salt solutions include sodium chloride, potassium chloride, and sodium sulfate. Acids such as phosphoric and acetic acid and bases such as ammonia and sodium hydroxides can also be used.

Attention!

- Use the column within above stated flow rate, pressure, and temperature ranges. Using the column outside the given range may damage the column and lower its performance.
- When using a mixture of buffer (or aqueous solution of salt) and organic solvent, make sure there is no precipitation of salt.
- When using highly corrosive salts such as sodium chloride, wash out the salts at the end of analysis. The metal parts of the devices and/or the columns may rust.
- Column pressure is influenced by eluent composition, flow rate, and column temperature. When changing the eluent compositions, adjust the flow rate and column temperature so that the column pressure remains below the usable maximum pressure.

5. Eluent Preparation

(1) Degas the eluent fully to prevent the formation of air bubbles.

(2) Presence of small debris or insoluble substances may result in deterioration of columns and/or they may appear as noise on chromatograms. Filter the eluent with a 0.45-μm disposable filter to prevent the problems from occurring.

Attention!

- Whenever water is required, use ultra-pure water freshly generated by a water purification system or water from a newly opened HPLC grade distilled water bottle. Use of HPLC grade organic solvents of guaranteed quality, which can be used without problems in HPLC is recommended. If organic solvents with different grades are used together, make sure that their qualities are all suitable for the analysis prior to the use. Solvents left in opened bottles for a long time should not be used. The content may have been changed, absorbed moisture, or has been contaminated.
- Always use freshly prepared solvents. Solvents stored for a long time may have changed their compositions and may influence elution patterns and/or damage the column.

Note

- Use of an on-line degasser is recommended.

6. Sample Preparation

(1) If possible, use the eluent for analysis to dissolve or dilute samples. If this is difficult, use a solvent which has a composition that is as close as possible to the eluent composition and which fully dissolves or dilutes the sample. For gradient elution, samples are recommended to be dissolved or diluted using the eluent used at the beginning of the gradient method.
e.g. When using a mixture of water (buffer) and over 50 % acetonitrile for the eluent: If the sample does not dissolve in the eluent well, first dissolve the sample with water (or buffer), and then add acetonitrile to make the final acetonitrile concentration in the sample more than 50 % (v/v).

(2) Filter diluted sample solutions using disposable 0.45-μm filters to prevent the column from clogging or deteriorating.

(3) Suggested injection volume is less than 5 μL per column.

(4) When a sample contains large amount of proteins or lipids, remove them prior to the sample injection.They may adsorb on the base material and damage the column.

Attention!

- When a sample is dissolved in a solvent other than the eluent and if the sample matrix contains components which do not dissolve in the eluent fully, precipitates may form and clog the column.
- Full column performance may not be achieved if a sample concentration is higher or sample injection volume is larger than it should be. It may lead to abnormal peak shapes, poor separations, and/or low reproducibility. In such cases, please adjust the sample concentration and/or the injection volume.

Note

- Use of a guard column is recommended to protect the analytical column.

7. Column Usage Procedure

HILICpak VG-50 2D is a semi-micro column. To achieve its best performance, please use it with a semi-micro type HPLC system.

7.1 HPLC System Preparation

Wash the entire HPLC system prior to column installation, including all flow-lines and sample loop by switching the valves, and then replace the washing solution with the eluent to be used. If desired new eluent has low miscibility/solubility to the eluent of previous analysis, first use the eluent that is miscible/soluble to both eluents, and then replace it with the desired eluent.

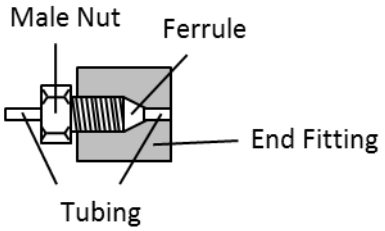
Attention!

- If the eluent left in the HPLC system is not compatible with the column to be used, it may damage the column.
- A drastic change in the eluent compositions may remove substances adsorbed on the HPLC system and they may enter and deteriorate the column.

7.2 Column Installation

(1) Connect the column to HPLC system by following the “flow direction arrow” (➞) indicated on the column adhesive label. If a guard column is used, position the guard column in front (before the inlet) of the analytical column.

(2) Make sure to insert the tubing all the way to the end fitting and secure it with the male nut. It is important that there is no extra space between the tubing and the column side of the end fitting. Presence of an extra space will let the sample to spread out and may result in wide peaks.



(3) Set the initial flow rate at less than 0.1 mL/min flow rate and start the system. If the column is to be heated during the analysis, keep the low flow rate until the column temperature reaches to the set temperature, and then gradually increase the flow rate to the desired.

Caution!

- Verify that there is no solvent leak. The solvent leak may cause electronic leakage, rust, and/or chemical injury.

Attention!

- Make sure not to let air bubbles enter the column while installing the column. The air bubbles may damage the column.
- When restarting the system after column installation or after holding the eluent flow, start the system at less than 0.1 mL/min flow rate. A rapid increase in pressure can damage the column.
- If the column was heated during the analysis, lower the flow rate to less than 0.1 mL/min flow rate at the end of analysis. Then, turn off the column oven to let the column temperature returns to room temperature before stopping the pump. This is to prevent creating an empty space in the column, which deteriorates the column. Since if the pump was stopped while the eluent inside the column is still hot, the eluent volume decreases and creates an empty space when the eluent temperature decreases.

Note

- It is recommended to set the pump limiter to avoid exceeding the maximum pressure.

7.3 Solvent Exchange

To replace the solvent, start the system at less than 0.1 mL/min flow rate. Recommended solvent volume to introduce at each step is 3 to 5 times of the column volume.

(1) Check miscibility/solubility of the desired new solvent and the solvent currently filled in the column.

(2) When replacing with a solvent having low miscibility/solubility to the current solvent, first use a solvent that is miscible/soluble to both (new and current) eluents, and then replace it with the new solvent.

e.g. When replacing from water/acetonitrile to a highly concentrated buffer solution, first run water and then replace it with the eluent.

(3) When using a gradient method, changes in the eluent compositions may increase the column backpressure. Adjust the flow rate and column temperature so that the column backpressure remains below the usable maximum pressure throughout the analysis.

Attention!

- When replacing the eluent from a mixture of watetr and acetonitrile to a mixture of buffer or salt solution and organic solvent, prepare the column by introducing 10 to 20 column volumes of buffer or salt solution (i.e., without organic solvent). Note when changing to a mixture of water and ethanole or to a simple buffer solution, this preparation step is not necessary.
- When replacing the eluent from a simple buffer or a mixture of buffer and organic solvent to a mixture of water and organic solvent, wash the column with alkaline solution first (Refer to section 7.4 Column Cleaning, Method 1).

7.4 Column Cleaning

Problems in peak shapes and elution time changes or elevated column pressure are often caused by the deposition of insoluble or adsorbing components from the sample/flow-line inside the column. These problems may be resolved by cleaning the column.

If a guard column is used with an analytical column(s), first remove the guard column and check the performance of the analytical column alone. If the problem is solved, most likely the cause was from the guard column. In this case, clean the guard column.

If the problem remains even after removing the guard column, clean both guard and analytical columns. Make sure to clean the guard and the analytical columns separately. In case multiple number of analytical columns are used together, wash them separately. During the column cleaning, disconnect the detector and collect the washing solution directly from the column outlet into a waste container (i.e., do not let the solution go through the detector).

If the column performance does not improve (recover) after performing the column cleaning, please replace the column with a new one.

<Cleaning method>

(1) Insoluble components that block the column inlet may be removed by reversing the flow direction, i.e., introducing the eluent from the column outlet, with flow rate at less than half of the recommended flow rate.

(2) Follow below cleaning steps for adsorbing components. For an efficient cleaning, reverse the flow direction. Set the flow rate at 0.1 mL/min.

Method 1: General cleaning

	Washing Solution	Cleaning Time
1	H_2O	6 min
2	0.1 M NaOH aq. solution	75 min
3	H_2O	12 min
4	Eluent	40 min

Method 2: Adsorption of metal ions or in case Method 1 did not work

	Washing Solution	Cleaning Time
1	H_2O	6 min
2	0.1 M HNO_3 aq. solution	75 min
3	H_2O	6 min
4	0.1 M NaOH aq. solution	75 min
5	H_2O	12 min
6	Eluent	40 min

Attention!

· Keeping the washing solution in the column for a long time will lead to column deterioration. Please replace the washing solution with the eluent immediately after cleaning.

· Strong alkaline solvents such as 0.1-M aqueous sodium hydroxide solution can damage the detector cell. Do not connect the detector while regenerating the column and collect elute directly from the column outlet to the waste container.

8. Column Storage

Remove the column from HPLC system after replacing the in-column solvent with the initial shipping solvent. Securely tighten the end caps and store the column at a location with stable temperature (a cool and dark space is recommended). Refer to section 7.3 Solvent Exchange for how to replace the eluent.

Attention! · Never allow inside the column to dry. It can damage the column.

9. Column Inspection

Please refer to the inspection method described in the CoA. At Shodex, “half width method” is adopted for the calculation of plate count and “asymmetry factor (Fas)” is adopted for the calculation of peak symmetry. Please refer to the Shodex website for the detail: https://www.shodex.com/en/da/07.html

Attention! · Plate count and Fas values change significantly depend on samples and/or analysis conditions being used. To check the initial column condition, please make sure to use the same sample and the analysis condition mentioned in the CoA.

10. Additional Warnings

(1) Do not remove end fittings.

(2) Do not make a strong impact on the column. Do not drop or hit the column on a hard surface.

(3) Please follow a proper waste disposal method specified by your local regulations.

Please refer to the Shodex website (https://www.shodex.com/) for product details and their applications. For additional assistance, contact the distributor from whom you purchased the column or contact your regional Shodex support office (https://www.shodex.com/en/support_office/list).