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OPERATING CONDITIONS and SPECIFICATIONS

TSK-GEL® SuperMultiporeHZ Products

| Part Numbers: | Dimensions | Product Name | Pore Size |
|---------------|-----------------------|--------------------------|-----------|
| 21815 | 4.6 mm ID x 15.0 cm L | SuperMultiporeHZ-N | 3 µm |
| 21816 | 4.6 mm ID x 2.0 cm L | TSKgel SuperMPHZ-N Guard | 3 µm |
| 21488 | 4.6 mm ID x 15.0 cm L | SuperMultiporeHZ-M | 4 µm |
| 21489 | 4.6 mm ID x 2.0 cm L | TSKgel SuperMPHZ-M Guard | 4 µm |
| 21885 | 4.6 mm ID x 15.0 cm L | SuperMultiporeHZ-H | 6 µm |
| 21886 | 4.6 mm ID x 2.0 cm L | TSKgel SuperMPHZ-H Guard | 6 µm |

This sheet contains the recommended operating conditions and the specifications for TSK-GEL SuperMultiporeHZ columns and guard columns. TSK-GEL SuperMultiporeHZ columns have different pores sizes within the same bead. TSK-GEL SuperMultiporeHZ-type columns are used exclusively for Gel Permeation Chromatography. Installation instructions and column care information are described in a separate Instruction Manual.

A. OPERATING CONDITIONS

- Shipping Solvent: Tetrahydrofuran (THF)
- Max. Flow Rate: 0.4 ml/min
- Standard Flow Rate: 0.15 - 0.35 ml/min
- Max. Pressure:

| | | |
|-------------------------|-----------|---------------------------|
| 40 kg / cm ² | = 600 psi | TSKgel SuperMultiporeHZ-N |
| 20 kg / cm ² | = 300 psi | TSKgel SuperMultiporeHZ-M |
| 10 kg / cm ² | = 100 psi | TSKgel SuperMultiporeHZ-N |
- Multiple Columns: TSK-GEL SuperMultiporeHZ columns of the same pore size can be connected in series to improve resolution. Connecting TSK-GEL SuperMultiporeHZ columns with different pore sizes or connecting them with other H-type columns will cause loss of linearity in the calibration curve. Connect analytical columns using short pieces of 1/16" stainless steel tubing with an internal diameter of 0.01" or smaller.
- Solvents: THF
- Temperature: 25 - 60°C
- Sample Size: 0.001 - 0.1 mg per 4.6 mm ID x 15.0 cm L column.
- Storage: The column can be left overnight in THF in the LC system. When it will not be used for longer periods of time, remove the column from the equipment, seal the ends with the provided protective screws, and store it at laboratory temperature. At all times, prevent air from entering the column!
- Column Protection: The use of guard columns is recommended to prolong the life of the analytical column. Guard columns are not for analysis, they do not improve resolution when connected to the main column. They are also not a substitute for filtering the mobile phase and the sample. A guard column does reduce pump pulsation, and further protects the main column by collecting highly adsorptive components and insoluble substances. Guard column life depends greatly on sample cleanliness. As a general rule, guard columns should be replaced when the peaks become excessively wide, or when the peaks show splitting.

B. SPECIFICATIONS

The performance of TSK-GEL SuperMultiporeHZ columns are tested under the conditions described in the Data Sheet. All analytical columns have passed the following quality control specifications:

| | | |
|----------------------------------|-----------|---------------------------|
| Number of Theoretical Plates (N) | ≥ 20,000 | TSKgel SuperMultiporeHZ-N |
| | ≥ 16,000 | TSKgel SuperMultiporeHZ-M |
| | ≥ 11,000 | TSKgel SuperMultiporeHZ-H |
| Asymmetry Factor (AF): | 0.7 - 1.4 | TSKgel SuperMultiporeHZ-N |
| | 0.7 - 1.4 | TSKgel SuperMultiporeHZ-M |
| | 0.7 - 1.4 | TSKgel SuperMultiporeHZ-H |

C.SOLVENT COMPATIBILITY for Multipore H_xL COLUMNS

Standard H-type columns are packed (and shipped) in tetrahydrofuran, with the exception of GMH-HT columns which are only shipped in o-dichlorobenzene. H-type columns are also available *per special order* packed in acetone, chloroform, dimethylformamide, or o-dichlorobenzene. The table below lists the solvents that may be used to replace the original shipping solvent.

Note: Only one solvent substitution can be made.

| <u>SHIPPING SOLVENT:</u> | <u>CAN BE REPLACED BY :</u> |
|------------------------------|---|
| Tetrahydrofuran ¹ | benzene, chloroform, toluene, xylene, dichloromethane, dichloroethane |
| Acetone | carbon tetrachloride ² , o-dichlorobenzene, dimethylformamide, dimethylsulfoxide, dioxane, ethylacetate, FC-113, hexane, hexafluoroisopropanol / chloroform, methylethylketone, N-methylpyrrolidine, pyridine,quinoline, cyclohexane, dodecane |
| Chloroform | m-cresol / chloroform, up to 10% hexafluoroisopropanol / chloroform |
| Dimethylformamide | dimethylsulfoxide, dioxane, tetrahydrofuran, toluene |
| o-dichlorobenzene | 1-chloronaphthalene, trichlorobenzene |

Important:

1. All TSK-GEL H6, H8, HXL, and GMH analytical columns are shipped containing tetrahydrofuran (THF), except GMH-HT columns, which contain **only** o-dichlorobenzene. THF in G1000H6, G1000H8 and G1000HXL, columns **cannot** be replaced with dichloromethane or dichloroethane.
2. Prolonged exposure to carbon tetrachloride can corrode the stainless steel parts of a column and an HPLC system.
3. 100% methanol cannot be used with H type columns; use this solvent with TSK-GEL Alpha type or SW type columns

How to Change Solvents

1. Use a linear gradient at a rate of change of 2% per minute
2. Use a flow rate of ≤ 0.5 ml/min for 7.5 mm ID and 7.8 mm ID columns.