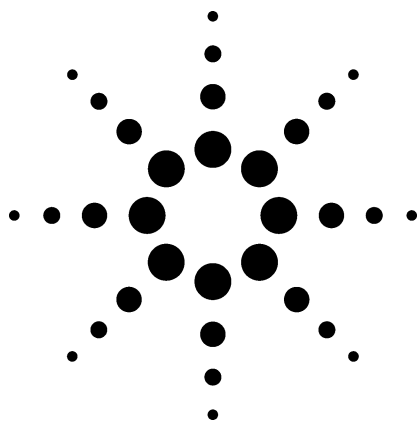




Agilent Zorbax PSM HPSEC

Datasheet

General Description

Zorbax PSM High Performance Size Exclusion Chromatography (HPSEC) Columns are packed with small ($5\ \mu\text{m}$) porous silica microspheres (PSM). These small particles provide for rapid (5-15 minutes) molecular size separations with high resolution. The rugged nature of these packings permits the use of a wide range of solvents including alcohols and water. The PSM packings are available in two versions. The deactivated version has been silanized for use with non-polar to relatively polar polymers in nonaqueous or partially aqueous solvents and is denoted by an S following the column name. The untreated version is for use with both nonaqueous and aqueous mobile phases. Approximate molecular weight ranges (determined using polystyrene standards) for Zorbax PSM columns are:

Zorbax PSM 60 (or 60S)	5×10^2 to 10^4
Zorbax PSM 300 (or 300S)	3×10^3 to 3×10^5
Zorbax PSM 1000 (or 1000S)	10^4 to 10^6
Zorbax PSM 3000 (or 3000S)	10^5 to 10^7
BIMODAL (or BIMODAL-S)	5×10^2 to 10^6

Column Characteristics

The Zorbax PSM HPSEC columns contain silica-based packings. They are ideally suited for high performance SEC. These rigid, siliceous PSM packings have high mechanical strength and are not swelled or dissolved by any common organic or aqueous (pH 2-7) mobile phases.

The Zorbax PSM packings are offered in both untreated and deactivated versions. The deactivated supports are recommended for use with organic solvents when fractionating polymers that are soluble in nonaqueous mobile phases. The untreated versions of these packings can be used with both aqueous and nonaqueous mobile phases. With organic mobile phases, these columns may retain some samples by adsorption.

Zorbax PSM columns are 6.2 mm ID with a column length of 250 mm. The packing is contained in the column by means of $2\ \mu\text{m}$ porosity frits. Columns may be calibrated using narrow-dispersion polystyrene or sulfonated polystyrene standards. Typically, samples containing 0.1% of standard are used (UV detection). The standards are run and the log molecular weight vs. retention volume is plotted (e.g., Figure 1). Polymers of unknown size can be characterized using the standard curve.

Zorbax PSM Columns can readily resolve polymers with molecular weights differing by a factor of 2-2.5 over the useful molecular weight range of the column. A separation of a commercial epoxy resin (Shell 836) on a PSM 60 column is shown in Figure 2 as an illustration of this column's molecular weight resolving power.

In analytical separations on a single column, the sample volume should be 40 microliters or less. Sample concentration of 0.3% or less is desirable for highest resolution. As sample size increases, resolution decreases due to peak broadening.

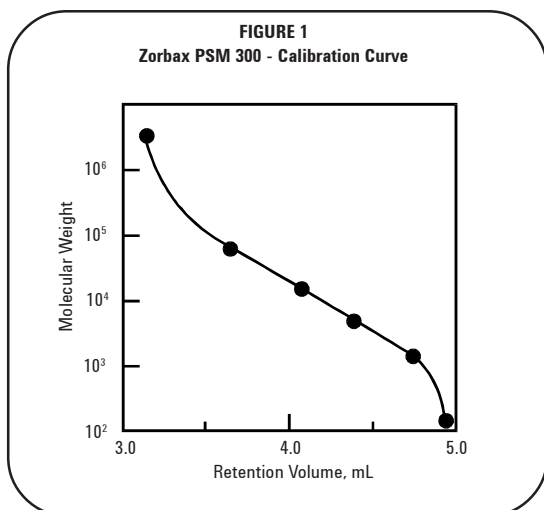
Typical permeation volume for Zorbax HPSEC columns is 5 mL. Thus, a separation run at 1mL/min will be over in less than 5 minutes. Depending on the resolutions required, flow rates higher or lower than this can be used.

Column Performance

All Zorbax PSM size exclusion columns are individually tested for minimum band spreading and peak tailing. The high performance characteristics of these columns are assured by measuring the efficiency (the number of theoretical plates, N) and peak skew of a totally permeating, low molecular weight monomer (e.g., toluene) peak.

Safety Considerations

- Before using any new size exclusion column at elevated temperature, purge it thoroughly with the desired mobile phase at room temperature.



- All points of connection in liquid chromatographic systems are potential sources of leaks. Users of liquid chromatographic equipment should be aware of the toxicity or flammability of their mobile phases.
- Because of its small particle size, dry Zorbax packings are respirable. Columns should only be opened in a well-ventilated area.

Operational Guidelines

- All Zorbax HPSEC columns contain methanol when received. Initially, care should be taken not to pass any material through the column that might have poor solubility in methanol.
- Connect the column so the flow of mobile phase is the same as indicated on the column.
- When connecting columns in series, it is recommended that the smaller pore size columns be placed first.
- Limit the maximum pressure to less than 200 bar (3000 psi).
- Use the columns in a range of pH 2 to pH 7 for the S version, or pH 2 to pH 8 for the untreated version.
- Filter samples before injection into the columns.
- Use a miscible series of solvents when changing from one mobile phase to another.
- Do not depressurize the column at the inlet end. Allow the system pressure to dissipate by flow through the outlet with the pump turned off.

Mobile Phase Selection

For size exclusion chromatography, it is necessary to completely solvate the sample. As a general rule, it is advisable to use as highly polar a solvent as possible to dissolve the sample. There are virtually no restrictions on the use of organic solvents as carriers for these columns. For polymer samples, tetrahydrofuran is a commonly used mobile phase.

In changing mobile phases between immiscible solvents, it is necessary to use an intermediate solvent such as isopropanol which is miscible with both liquids.

Applications

Zorbax PSM Size Exclusion Columns are used for molecular size separations on most synthetic and naturally occurring polymers. For samples of wide molecular weight distribution, it is useful to couple columns of one or more pore sizes in series or to employ Bimodal Column Kits (MW range 5×10^2 to 10^6). When coupling columns in series, use low dead volume connectors such as P/N 880958-901. Calibration of the columns is achieved by use of appropriate molecular weight standards as previously described. Complex sample mixtures can often be successfully separated by first applying size exclusion techniques to collect molecular weight fractions and then separating molecular species within these fractions by interactive LC methods (partition, adsorption or ion exchange).

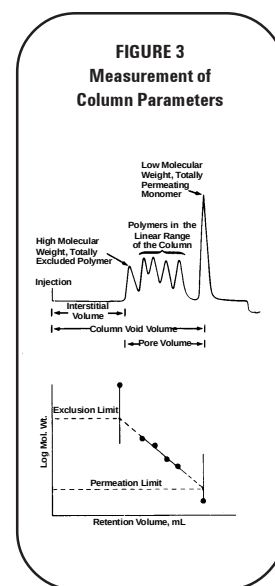
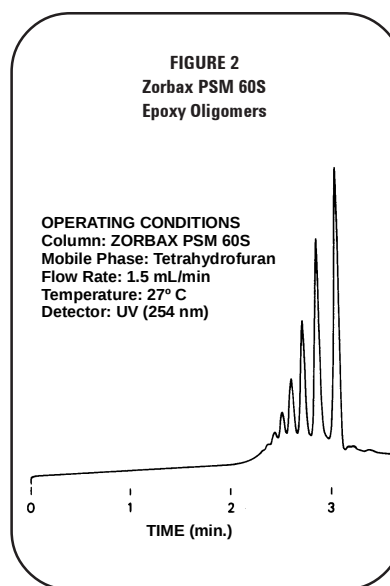
More detailed information on application is available in *Modern Size Exclusion Liquid Chromatography*, W. W. Yau, D. D. Bly, and J. J. Kirkland, (John Wiley and Sons) 1979.

Ordering Information

6.2 mm ID x 250 mm (5 μ m) Columns

Description	MW Range	Silanized	Part No.
PSM 60	5×10^2 - 1×10^4	No	880957-801
PSM 60S	5×10^2 - 1×10^4	Yes	880957-802
PSM 300	3×10^3 - 3×10^5	No	880957-805
PSM 300S	3×10^3 - 3×10^5	Yes	880957-806
PSM 1000	1×10^4 - 1×10^6	No	880957-807
PSM 1000S	1×10^4 - 1×10^6	Yes	880957-808
PSM 3000	1×10^5 - 1×10^7	No	880957-809
Bimodal-S	5×10^2 - 1×10^6	Yes	880957-814
Bimodal Kit	5×10^2 - 1×10^6	No	880949-903
Bimodal Kit-S	5×10^2 - 1×10^6	Yes	880949-904

Agilent Part No.



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