



TOSOH BIOSCIENCE

TOSOH



Column Flyer

New high performance polymeric analytical columns for SEC and GPC

Take advantage of the versatile and rigid TSKgel SuperAW columns. Speed up your method development and let the column do what **YOU** want!

NEW universal steric exclusion columns

NEW SEC columns and capillaries

NEW High resolution columns

Introduction

Size exclusion chromatography (SEC) as a method to separate compounds by their molecular sizes is widely used for the separation, purification and determination of molecular weight distributions of hydrophilic as well as of hydrophobic substances.

Usually hydrophobic compounds are analyzed with organic solvents on a polystyrene-divinylbenzene matrix (represented by the H-type column series), whereas SEC of polar compounds needs aqueous solvents and a hydrophilic matrix, based either on silica (the SW and SWXL series) or on polymethacrylate (represented by the PW and PWXL series).

Analysis of polar, non water soluble macromolecules always was difficult on both resin types, due to their limited solvent compatibility.

Table 1. Solvent Compatibilities for TSK-GEL SEC Matrices

Water/aqueous solution Aqueous buffer systems	polar organic solvent Methanol/Ethanol/ Isopropanol Acetonitrile/DMSO/DMF	non-polar organic solvent THF/Acetone/Methylene chloride* Chloroform* Toluene*/Hexane*
PW, PW _{XL}		
SW, SW _{XL} , Super SW		
		H and H _{XL}
		H _{HR}
	Alpha, SuperAW	

*for H-type columns only

With the introduction of Alpha-Series, and now the TSKgel SuperAW column series, this restriction was overcome due to a resin based on a hydrophilic, highly crosslinked vinyl polymer. This resin, which is solvent compatible from pure aqueous up to 100 % organic mobile phases*¹⁾, enables SEC of various polymers soluble either in aqueous solutions or in organic solvents.

Table 2. Features of TSKgel Super AW columns

Grade	Exclusion limit (PEO/DMF)	Particle size (µm)	Theoretical Plates	Dimension (mm ID x cm L)
TSKgel SuperAW2500	2×10^3	4	> 16,000	6.0 x 15
TSKgel SuperAW3000	6×10^4	4	> 16,000	6.0 x 15
TSKgel Super AW4000	4×10^5	6	> 10,000	6.0 x 15
TSKgel SuperAW5000	4×10^6	7	> 10,000	6.0 x 15
TSKgel SuperAW6000	$> 4 \times 10^7$	9	> 6,000	6.0 x 15
TSKgel SuperAWM-H	$> 4 \times 10^7$	9	> 6,000	6.0 x 15

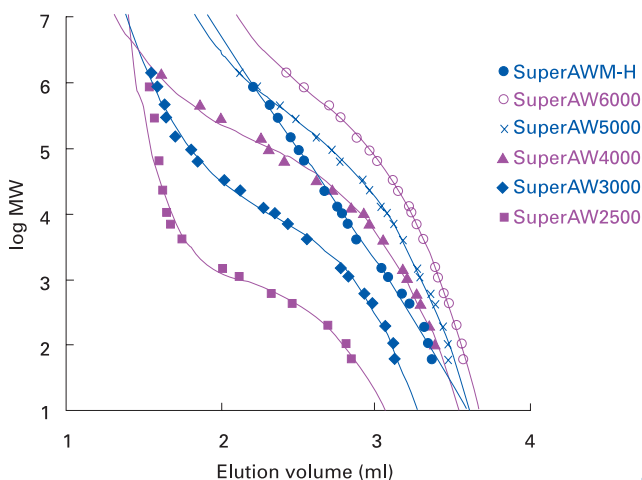
New TSKgel SuperAW column series

The TSKgel SuperAW column series consists of six SEC-column types. The analytical columns are packed with a micro-particle sized, mechanically stable hydrophilic polymer with different pore sizes.

*1) Exception: Chloroform, Toluene, Hexane

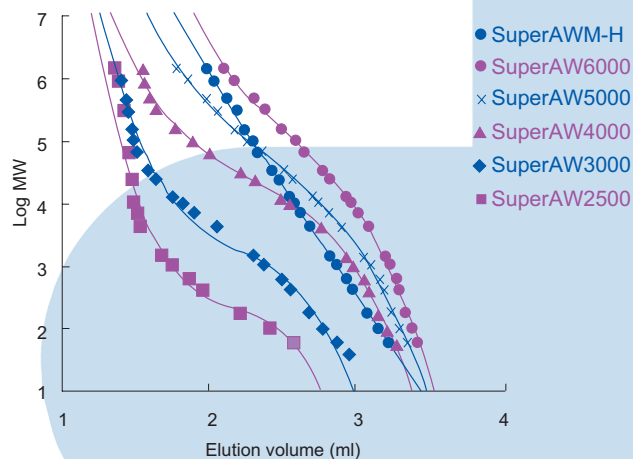
The different pore sizes of the resins allow for a wide separation range of 100-1.000.000 Da using Polyethylene oxides (PEO), and, in addition, each column type shows a high degree of linearity considering the specific calibration range for the respective column.

Figure 1. Calibration curves of PEO and PEG in water



Column: 6.0 mm ID x 15 cm L
 Eluent: Water
 Flow rate: 0.6 ml/min
 Temp.: ambient
 Detect.: RI
 Sample: Standard polyethylene oxide, polyethylene glycol, ethylene glycol
 Sample conc.: 0.04-0.1% each

Figure 2. Calibration curves of PEO and PEG in DMF

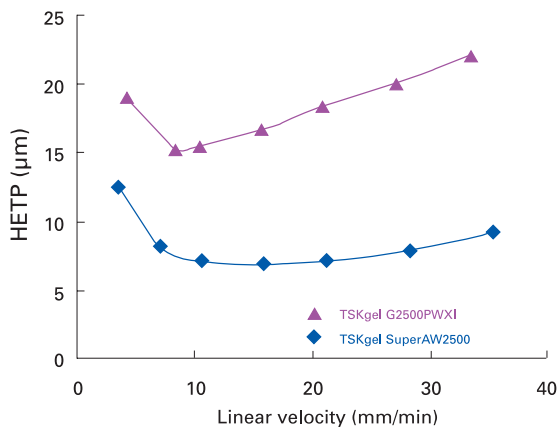


Column: 6.0 mm ID x 15 cm L
 Eluent: 10mM LiBr in DMF
 Flow rate: 0.6 ml/min
 Temp.: 40 °C
 Detect.: RI
 Sample: Standard polyethylene oxid, polyethylene glycol, ethylene glycol
 Sample conc.: 0.04-0.1% each
 Inj. Vol.: 10 µl

The combination of small particle sized resins and short column dimensions results in a superior separation performance of TSK-GEL SuperAW columns compared to conventional SEC-columns.

As demonstrated in the plot in figure 3, showing column performance in relation to flow rates, HETP values are smaller and less dependent on flow rate than with conventional columns.

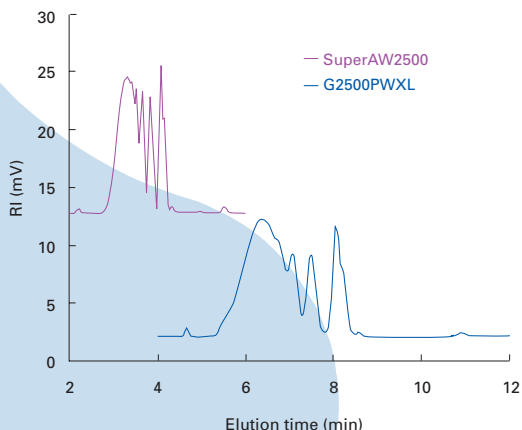
Figure 3. Plots of HETP vs. linear velocity



Columns: TSKgel SuperAW2500 (6.0 mm ID x 15 cm L)
 TSKgel G2500PWXL (7.8 mm ID x 30 cm L)
 Eluent: Water
 Temp.: ambient
 Detect.: RI
 Sample: Ethylene glycol, 2.5g/l
 Inj. Vol.: 5 µl (Super AW2500)
 20 µl (G2500PWXL)

This, in practice means that the 15 cm TSKgel SuperAW column provides almost the same theoretical plate number than conventional SEC-columns with 30 cm length, enabling shorter analysis times followed by reduced solvent consumption.

Figure 4. Performance Comparison of TSKgel SuperAW2500 vs. TSKgel G2500PWXL

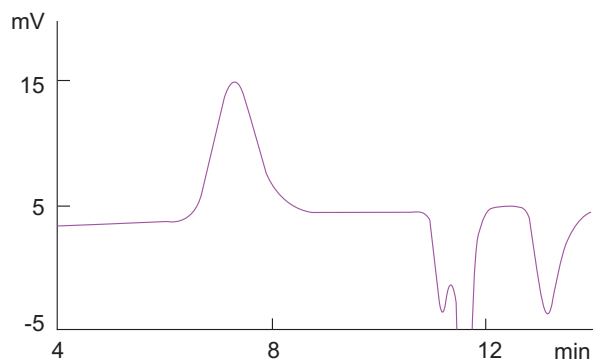


Column: TSKgel SuperAW2500 (6.0 mm ID x 15 cm L)
 Eluent: Water
 Sample: hydrolysate of dextran T-40
 Flow rate: 0.6 ml/min
 Sample load: 5 µl
 Column: TSKgel G2500PWXL (7.8 mm ID x 30 cm L)
 Flow rate: 1.0 ml/min
 Sample load: 10 µl

Applications

Various applications of the TSKgel SuperAW columns are available on request. As an example the analysis of Polyacrylonitrile in DMF containing 10 mmol Lithium is shown (Figure 5).

Figure 5. Analysis of Polyacrylonitrile in DMF



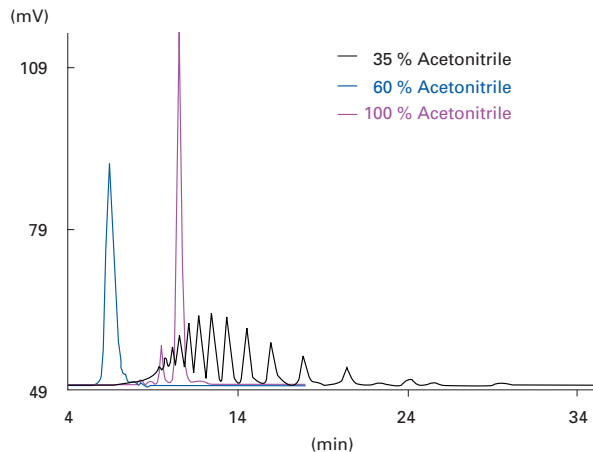
Column: TSKgel SuperAWM-H (6.0 mm ID x 15 cm L, two in series)
 Eluent: DMF containing 10mmol/L LiBr
 Flow rate: 0.6ml/min
 Temperature: 40 °C
 Detection: Refractive index detector
 Sample load: 20µL (0.5g/L)

Separation by Non-SEC mode

The excellent solvent compatibility of the TSKgel SuperAW also enables analysis of small or complex compounds in different **Non-SEC-modes**. As shown in figure 7 different chromatograms can be obtained from a surfactant by changing the eluent from 35% of acetonitrile to 100% of acetonitrile. The sample is separated based on molecular size with 60% acetonitrile and it is retained on the column in other eluent compositions based on either hydrophobic or ionic interactions.

Thus it is possible to set up different elution conditions to suit the purpose of measurement in **one** column.

Figure 6. Separation of Triton X-100 by non-SEC mode



Column: TSKgel SuperAW2500 (6.0 mm ID x 15cm L, two in series)
 Sample: Triton X-100
 Eluent: dif. Acetonitrile / Water solutions
 Flow rate: 0.6 ml/min
 Temperature: 40°C
 Detection: UV 280nm
 Injection volume: 20 µl
 Sample concentr.: 1.0 g/l

Conclusions

- TSKgel SuperAW columns are allround SEC columns for initial analysis of unknown samples
- Hydrophilic resin with little swelling and shrinkage is compatible to wide range of solvent (water to organic solvent)
- Rigid resin with excellent mechanical stability leads to pressure stability up to 600psi = 4.0Mpa
- Micro-particle gel packed into analytical columns allows short analysis times and high resolution power
- Five pore sizes and a mixed-bed enable a wide separation range
- Separations possible by SEC, non-SEC or mixed mode allow to optimize the chromatographic method to analytical needs

**For further details of choice
and selection of the
suitable TSK-GEL column
that best meets
your particular needs.
please contact us:**

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or

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or

www.tosohbioscience.com

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- Laboratory Catalogue**
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