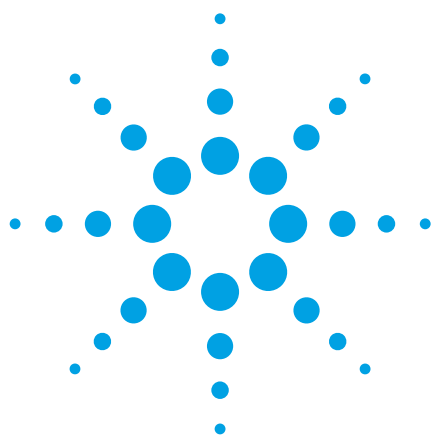




Selecting Agilent Columns for Gel Permeation Chromatography

Technical Overview

Introduction

Agilent MIXED gel technology for gel permeation chromatography and size exclusion chromatography columns has developed rapidly. Individual pore size gels can be blended together to give a column that exhibits a linear calibration spanning a molecular weight range suitable for a particular application.

For a given particle size of packing material, selectivity in GPC/SEC separations is controlled by the slope of the calibration curve in the molecular weight region of interest. Calibration slope is affected by column length and the pore size distribution of the packing material.

Figure 1 illustrates the effect of column length on the resolution of polystyrene standards using a MIXED gel packing. Multiples of MIXED gel columns are normally required to provide sufficient resolution (Figure 1b). Compared to a MIXED gel packing, an individual pore size gel provides resolution over a limited molecular weight range, restricted to a region in the calibration curve that is linear, and has a relatively shallow slope (Figure 1a).



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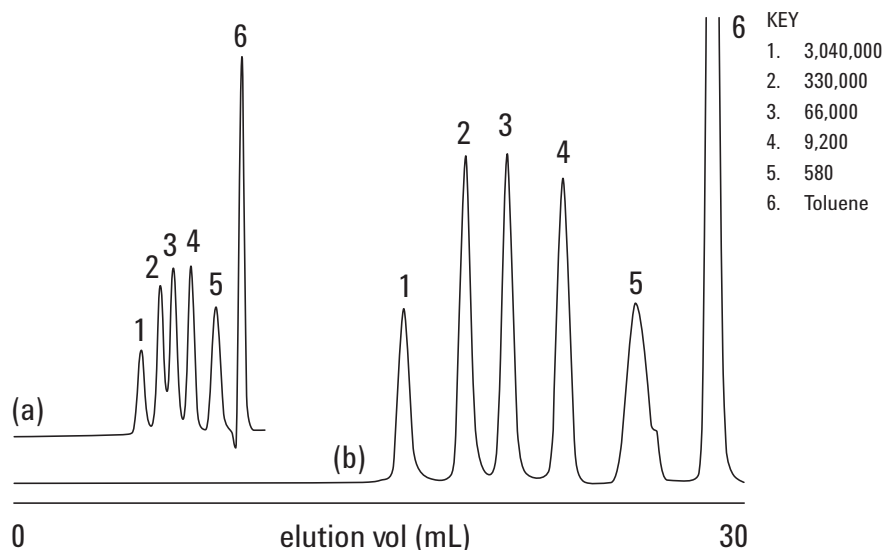


Figure 1. Effect of column length on separation. a) single Agilent PLgel 10 µm MIXED-B columns, b) three PLgel 10 µm MIXED-B columns.

Conditions for Figure 1

Calibrants	Agilent EasiCal
Columns	1 × Agilent PLgel 10 µm MIXED-B, 7.5 × 300 mm (p/n PL1110-6100) or 3 × Agilent PLgel 10 µm MIXED-B, 7.5 × 300 mm
Eluent	THF (stabilized)
Flow rate	1.0 mL/min
Detector	VWD, 254 nm
System	Agilent 1260 Infinity GPC-SEC Analysis System

Figures 2a and 2b show a comparison of the calibration characteristics for a MIXED gel and an individual pore size gel. In the case of the Agilent PLgel 5 µm MIXED-C packing, the linear resolving range is 200 to 2,000,000, whereas the most useful region in the PLgel 10⁴Å gel is 10,000 to 500,000. However, within the more limited range of the PLgel 10⁴Å packing, the calibration curve is shallow and, as shown in Figures 3a and 3b, within this molecular weight region, resolution will be superior.

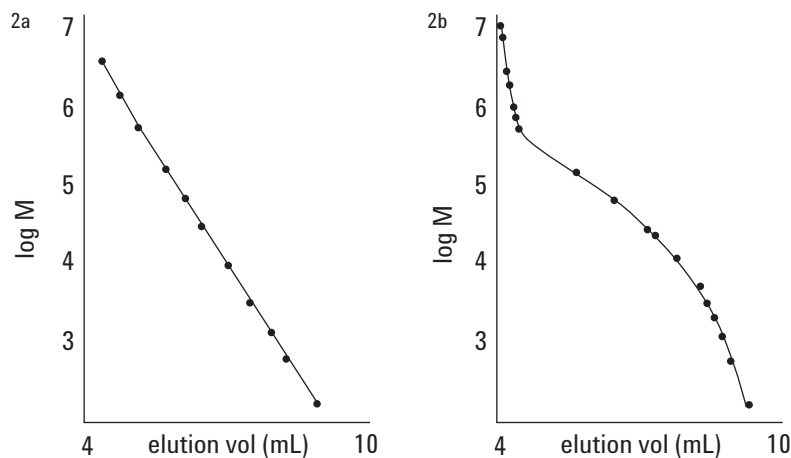


Figure 2a . Comparing pore size distribution for Agilent PLgel 5 μm MIXED-C.

Figure 2b. Comparing an individual pore size PLgel 5 μm 10⁴ Å column.

Conditions for Figures 2a and 2b

(a)

Column Agilent PLgel 5 μm MIXED-C, 7.5 × 300 mm (p/n PL1110-6500)
 Eluent THF
 Flow rate 1.0 mL/min

(b)

Column Agilent PLgel 5 μm 10⁴ Å, 7.5 × 300 mm (p/n PL1110-6540)
 Eluent THF
 Flow rate 1.0 mL/min

Column selection in GPC depends heavily on the range of applications involved. In the case of the two columns described above, the PLgel 5 μm 10⁴ Å would certainly be more useful in separating discrete, narrow polydispersity polymers within its optimum molecular weight range, styrenic block copolymers, for example. However, in the case of high molecular weight additives, the MIXED gel approach is generally most favorable. MIXED gel columns, particularly the PLgel 10 μm MIXED-B, are also very useful as scouting columns used to screen unknown samples prior to making a more appropriate column selection.

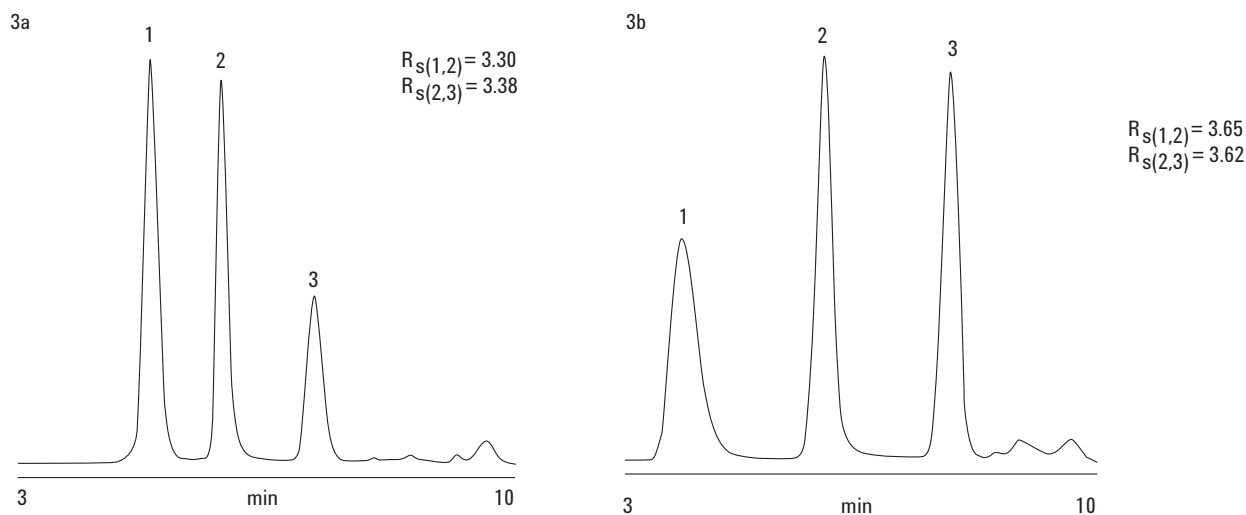


Figure 3a. Separation of test probes on Agilent PLgel 5 μ m MIXED-C.

Figure 3b. Separation of an individual pore size PLgel 5 μ m $10^4\text{\AA}$ column.

Conditions for Figures 3a and 3b

(a)

Columns Agilent PLgel 5 μ m MIXED-C, 7.5 $\times$ 300 mm (p/n PL1110-6500)
 Eluent THF
 Flow rate 1.0 mL/min

(b)

Columns Agilent PLgel 5 μ m $10^4\text{\AA}$, 7.5 $\times$ 300 mm (part number PL1110-6540)
 Eluent THF
 Flow rate 1.0 mL/min
 Test probes Polystyrene standards
 1. Mp = 552,500
 2. Mp = 66,000
 3. Mp = 5,050

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GPC/SEC Columns and Calibrants from Agilent

Agilent offers a comprehensive portfolio of GPC/SEC columns and calibrants for high-performance separations based on molecular size in solution. Agilent delivers leading solutions for characterizing and separating polymers by GPC/SEC, and manufactures all components for accurate polymer analysis.

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