# Particle Size and Injection Volume Affects Resolution of Agilent PLgel 100Å Columns

## Technical Overview

### Introduction

Two factors that can affect the efficiency and therefore resolution of columns for gel permeation chromatography/size exclusion chromatography (GPC/SEC) are the particle size of the column packing materials and the amount of dead volume in the system. This note illustrates the effect of these two factors on the efficiency of Agilent PLgel 100Å, 300 × 7.5 mm columns.

Column efficiency and therefore resolution in GPC/SEC is directly related to the particle size of the column packing materials. Smaller particles lead to higher efficiencies (higher plate counts) and therefore to higher resolution. The effect of particle size on resolution is clearly demonstrated by the oligomer resolution of polystyrene 580 using Agilent PLgel 3 µm, 5 µm, and 10 µm 100Å columns.

Figure 1 shows an overlay of three chromatograms obtained on the columns. The increase in resolution with decreasing particle size is clearly evident. Although all three columns are packed with media of the same pore size, the decreasing particle size leads to increasing efficiency and therefore higher resolution. However, in order to obtain the highest efficiencies with small particle size columns, the dead volume in the system must be minimized as band-broadening effects due to extra-column dispersion can be significant.

Figure 2 is an overlay of chromatograms of polystyrene 580 obtained on an Agilent PLgel 3 µm 100Å column, using 100 µL or 20 µL loops. The loss of resolution with the larger injection loop is clearly evident.

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## Conditions

| | |
|---|---|
| Sample | Agilent Polystyrene 580, 0.2% (w/v) |
| Columns | Agilent PLgel 3 µm 100Å, 300 × 7.5 mm (p/n PL1110-6320) |
| | Agilent PLgel 5 µm 100Å, 300 × 7.5 mm (p/n PL1110-6520) |
| | Agilent PLgel 10 µm 100Å, 300 × 7.5 mm (p/n PL1110-6120) |
| | (tested individually) |
| Eluent | THF |
| Flow rate | 1.0 mL/min |
| Injection volume | 20 µL or 100 µL |
| Detector | RI |
| System | Agilent PL-GPC 50 |



Figure 1.  An overlay of three chromatograms obtained on Agilent PLgel 3 µm, 5 µm and 10 µm columns, showing the increase in resolution with decreasing particle size.

## Agilent PLgel Columns

Agilent PLgel individual pore size columns offer high resolution over a specific molecular weight range. The family extends from PLgel 3 µm 100Å, with an effective MW range up to 4,000 and guaranteed efficiency greater than 100,000 plates per meter, to the Agilent PLgel 10 µm 106Å, with effective MW from 600,000 to 107 and efficiency above 35,000 p/m.

## 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.

Look at the Agilent Literature Library on www.agilent.com/chem/gpc-sec for a comprehensive range of application notes and technical overviews to help you get the best from your Agilent GPC/SEC columns and instruments.
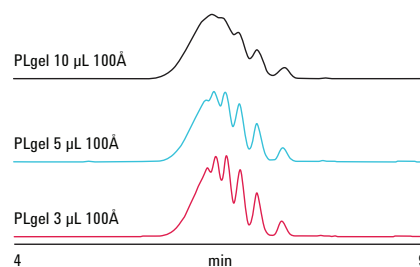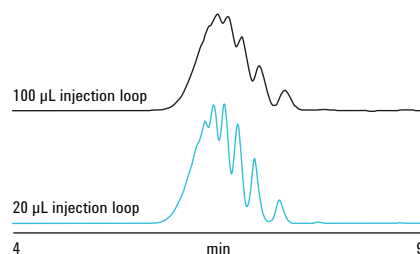


Figure 2.  An overlay of chromatograms of polystyrene 580 on an Agilent PLgel 3 µm column to illustrate the loss of resolution that results from using a larger injection loop.

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