

# Polymer Analysis with Polar Organic Solvents using Agilent PLgel Columns and GPC

## Application Note

Materials Testing and Research, Polymers

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### Introduction

Increasingly, the choice of solvent for use as an eluent in gel permeation chromatography (GPC) is becoming more diverse since the polymers to be analyzed are more demanding in terms of solubility. Polar organic solvents are often the most suitable choice. However, such solvents usually exhibit relatively high viscosity, and demand the application of elevated temperature in order to improve the separation and reduce the column operating pressure. Agilent PLgel columns are used extensively in these application areas.

### Polymer Analysis using Polar Organic Solvents

Agilent PLgel 10  $\mu\text{m}$  MIXED-B columns are typically employed for the analysis of high molecular weight, polydisperse materials. Table 1 shows some of these compounds with associated solvents for analysis by GPC. Figures 1 and 2 illustrate typical examples of these types of application.



Table 1. Appropriate Solvents for a Range of Polymer Types

Polymer	Solvent
Acrylonitrile butadiene styrene (ABS)	Dimethyl formamide (DMF)
Cellulose	Dimethyl sulfoxide/dimethylacetamide (DMSO/DMAC)
Poly(acrylates)	DMF/DMAC
Poly(acrylonitrile)	DMF
Poly(ethylene oxide)	DMF
Poly(urethane)	DMF/DMAC
Poly(vinyl pyrrolidone)	DMF/DMAC

### Conditions for Figure 1

Columns 2 × Agilent PLgel 10 μm MIXED-B, 7.5 × 300 mm (p/n PL1110-6100)  
 Eluent DMAC + 0.02 M LiBr  
 Flow rate 1.0 mL/min  
 Temp 60 °C  
 Detector 390-MDS Multi Detector Suite RI

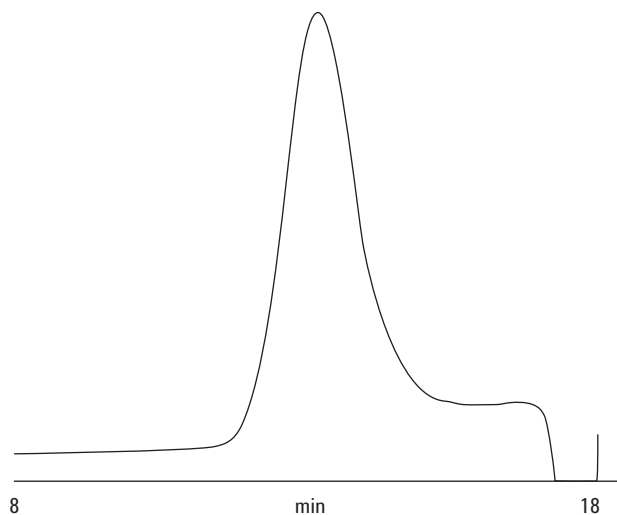


Figure 1. Polyurethane copolymer analysis using an Agilent PLgel 10 μm MIXED-B two-column set.

### Conditions for Figure 2

Columns 2 × Agilent PLgel 5 μm MIXED-D, 7.5 × 300 mm (p/n PL1110-6504)  
 Eluent THF  
 Flow rate 1.0 mL/min  
 Temp 40 °C  
 Detector 390-MDS Multi Detector Suite RI

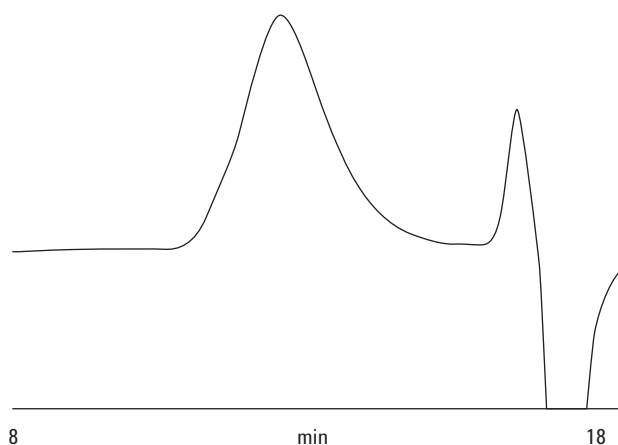


Figure 2. Acrylonitrile butadiene styrene analysis on an Agilent PLgel 5 μm MIXED-D two-column set.

Low pore size PLgel columns are also fully compatible with polar organic solvents, and have applications in resin analysis and the determination of low molecular weight species in polymers, as illustrated in Figure 3.

## Conditions for Figure 3

Columns 2 × Agilent PLgel 5  $\mu\text{m}$  50Å, 7.5 × 300 mm  
(p/n PL1110-6515)  
Eluent DMF + 0.1% LiBr  
Flow Rate 1.0 mL/min  
Temp 60 °C  
Detector 390-MDS Multi Detector Suite RI

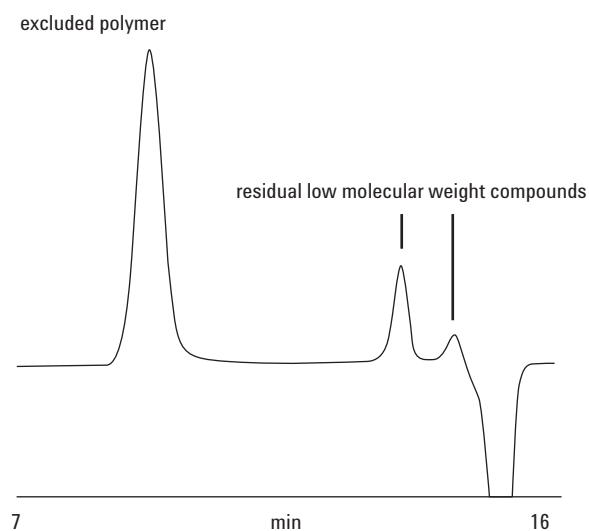


Figure 3. Analysis of residual monomers in acrylonitrile butadiene styrene on an Agilent PLgel 5  $\mu\text{m}$  two-column set.

## Conclusions

The compatibility of packing materials for gel permeation chromatography with polar organic solvents assumes increasing importance in high performance separations of modern polymer systems. Column performance should be unaffected by solvent transfer, which demands a high degree of chemical and physical stability in the column bed, as delivered by Agilent PLgel packing.

## For More Information

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