Asphalt Analysis with Agilent PLgel Columns and Gel Permeation Chromatography

Application Note

Materials Testing and Research, Polymers

Author

Graham Cleaver

Agilent Technologies, Inc.

Introduction

Asphalt is the residual left when practically everything that can be recovered from crude oil by high vacuum, high temperature distillation has been vaporized. The result is a sticky, near solid material containing a vast array of compounds varying from paraffins to highly condensed aromatics. The choice of solvent for use as eluent in gel permeation chromatography (GPC) is very important. Polar materials in asphalt tend to associate and be adsorbed on the packing material. In addition, GPC results are affected by interactions with the solvent, which affect the apparent hydrodynamic volume.

Analysis of Asphalt

Many asphalt applications can be successfully carried out using tetrahydrofuran (THF) as eluent. Figure 1 shows such a comparison of two batches of asphalt, indicating differences in molecular weight distribution. Agilent PLgel GPC columns are compatible with solvents covering a wide range of polarity.

Verified for Agilent
1260 Infinity
GPC/SEC System

Agilent Technologies

Conditions for Figure 1

Columns	2 × Agilent PLgel 5 µm MIXED-D, 7.5 × 300 mm (p/n PL1110-6504)
Eluent	THF (stabilized)
Flow rate	1.0 mL/min
Detector	RI
System	Agilent PL-GPC 50

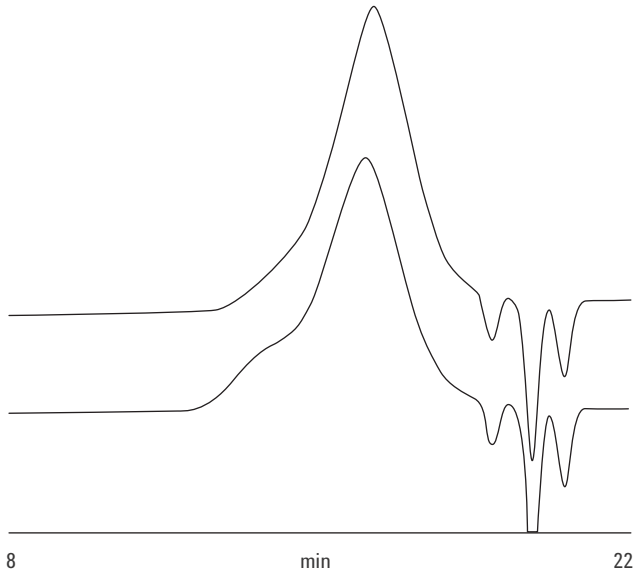

Figure 1. Comparing two batches of asphalt using an Agilent PLgel 5 µm MIXED-D two-column set with tetrahydrofuran as eluent.

Conditions for Figures 2 and 3

Columns	2 × Agilent PLgel 3 µm MIXED-E, 7.5 × 300 mm (p/n PL1110-6300)
Eluent	o-Xylene
Flow rate	0.5 mL/min
Detector	RI
System	Agilent PL-GPC 50

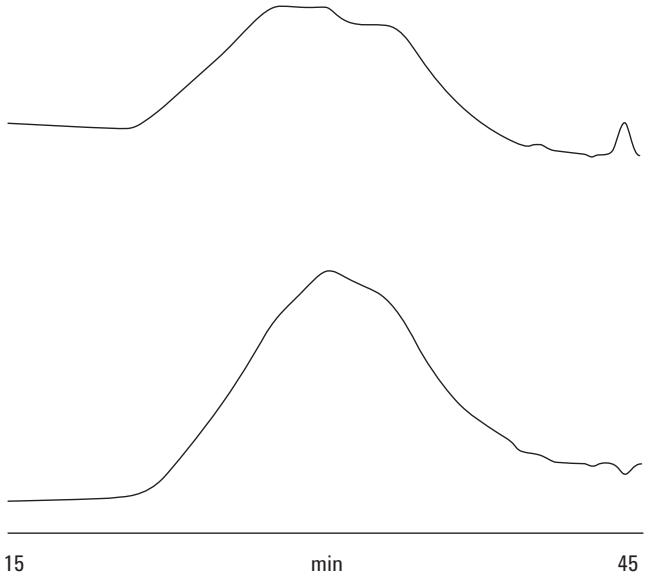

Figure 2. Comparing two batches of asphalt using an Agilent PLgel 5 µm MIXED-E two-column set with o-xylene as eluent.

Figure 2 shows another comparison of two polydisperse asphalt samples, this time analyzed using xylene as eluent. The higher viscosity of this solvent requires either a reduction in flow rate or elevation of temperature to reduce column operating pressure. The polystyrene standards separation for this application is illustrated in Figure 3. Other suitable solvents include benzene, toluene, and chloroform, all of which are compatible with PLgel columns.

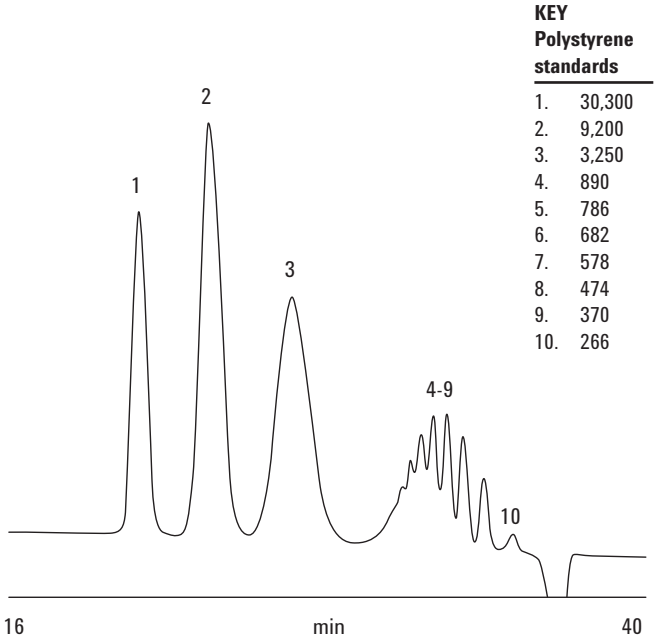

Figure 3. Separation of low molecular weight polystyrene standards on Agilent PLgel 3 µm MIXED-E columns.

Conclusions

Agilent PLgel columns can be used in a variety of solvents to investigate the composition of complex materials such as asphalt by gel permeation chromatography.

For More Information

These data represent typical results. For more information on our products and services, visit our Web site at www.agilent.com/chem.

www.agilent.com/chem

Printed in the USA
April 30, 2015
5990-8493EN

Agilent Technologies