Analysis of Polyols by GPC with Viscometry

Application Note

Authors

Greg Saunders, Ben MacCreath
Agilent Technologies, Inc.

Introduction

Polyols are polymeric species containing multiple hydroxyl functionalities typically used as the precursors to other polymers. For example, the formation of polyurethanes results from the reaction of a polyol with an isocyanate. Typically in low molecular weight species, the distribution of oligomeric chains in polyols can influence the final properties of polymers formed on further reaction, as well as the rate at which such reactions proceed. Understanding molecular weight distribution is an important factor in controlling the application of polyols. Two different samples of polyol were investigated because in final end-use applications the materials were observed to behave differently. To determine the molecular structure of the materials, they were analyzed on an integrated GPC system.

Agilent Technologies

Instrumentation

The polyols were assessed on a Agilent PL-GPC 50 Plus with differential refractive index detector, Agilent PL-BV 400RT viscometer and Agilent ResiPore columns, which provide high resolution of resin and condensation polymers.

Columns: 3 x ResiPore, 300 x 7.5 mm (p/n PL1113-6300)

Materials and Reagents

Samples: 2 x Polyol
Eluent: Tetrahydrofuran

Conditions

Flow Rate: 1 mL/min
Temperature: 40 °C

Results and Discussion

Figures 1 and 2 show chromatograms of the two polyols, and Figure 3 is the overall molecular weight distribution. The viscometer chromatogram of the second sample showed a noticeable high molecular weight component that was not observed on the refractive index trace, indicating a very small amount of high molecular weight material (Figure 2). The Mark-Houwink plot reflected the presence of the high molecular weight material and the change in the slope of the plot indicated that the high molecular weight component was structurally different to the rest of the sample (Figure 4).

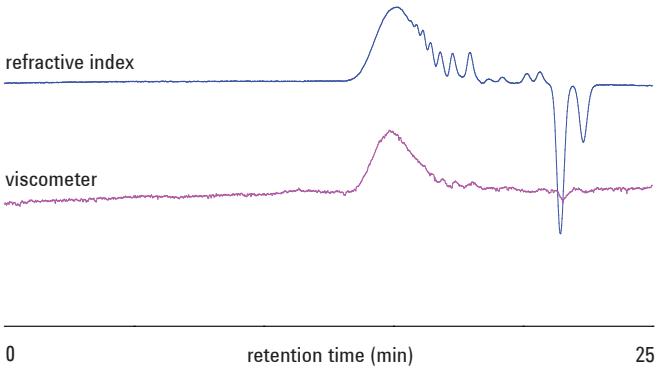

Figure 1. Chromatograms for the first polyol sample

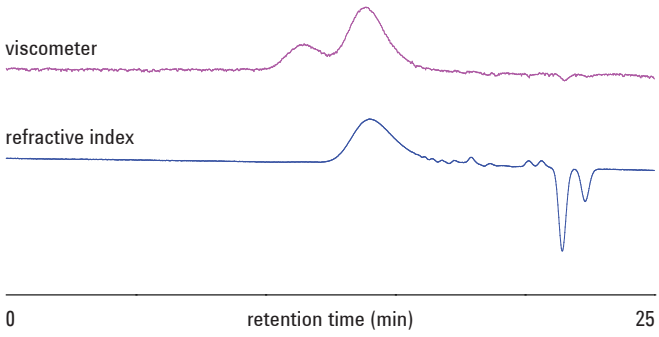

Figure 2. Chromatograms for the second polyol sample

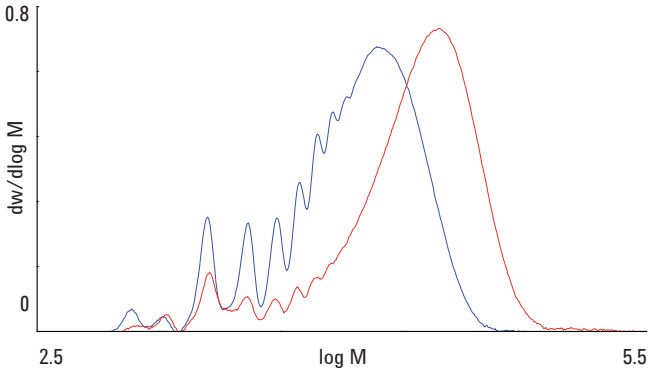

Figure 3. Overlaid molecular weight distributions for two polyol samples

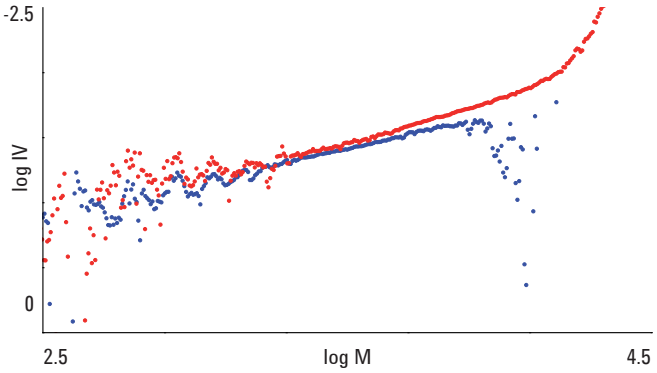

Figure 4. Overlaid Mark-Houwink plots for two polyol samples

Conclusion

The PL-GPC 50 Plus is a high resolution, cost effective integrated GPC system designed for operation from ambient to 50 °C. The standard system comprises precision solvent delivery, sample injection, high performance differential refractive index detection and a column oven, with fully integrated software control. When coupled with ResiPore columns and a PL-BV 400RT viscometry detector, the PL-GPC 50 Plus provides accurate molecular weight determination of polyols.

www.agilent.com/chem

Published in UK, September 2, 2010
SI-01514

Agilent Technologies