

# Polyurethane Prepolymer Analysis on Agilent PLgel MIXED-E by GPC

## Application Note

Materials Testing and Research

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### Introduction

The term polyurethane encompasses a range of materials that contains a urethane (-NHC00-) group in the backbone repeat unit. Typically, these materials also contain ester or amide groups and are usually produced by the reaction of a diisocyanate with a diol or polyol in a step-growth reaction. Polyurethanes are among the most versatile polymers, with a wide range of applications ranging from elastomers, fibers and rigid/semi-rigid foams to solid plastics, coatings, and adhesives. Many polyurethanes are produced in a one-shot process, but some are manufactured by a two-stage synthesis, involving the formation of a prepolymer. In these processes, a polyester or polyester polyol is reacted with a diisocyanate to produce a stable isocyanate-terminated prepolymer. This can then be further reacted with chain extenders or crosslinking agents to produce the final polyurethane. The prepolymer process has often been used to manufacture rigid-polyurethane foams due to low reactivity of many polyols.

In these reactions, the properties of the prepolymer must be carefully controlled to ensure complete reaction. Gel permeation chromatography (GPC) is often used to characterize prepolymers. This application note describes the fingerprinting of the oligomer distribution of a polyurethane prepolymer by GPC.



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## Polyurethane Prepolymer Analysis

Two high resolution Agilent PLgel 3  $\mu$ m MIXED-E columns are used, with dichloromethane as eluent and differential refractive index (DRI) detection. As seen in Figure 1, the MIXED columns resolve the individual components of the oligomer distribution of a prepolymer, allowing the reactivity of the prepolymer to be assessed.

### Conditions

Columns	2 $\times$ Agilent PLgel 3 $\mu$ m MIXED-E, 7.5 $\times$ 300 mm (p/n PL1110-6300)
Eluent	DCM
Flow rate	1.0 mL/min
Inj vol	20 $\mu$ L
Detector	RI
System	Agilent PL-GPC 50

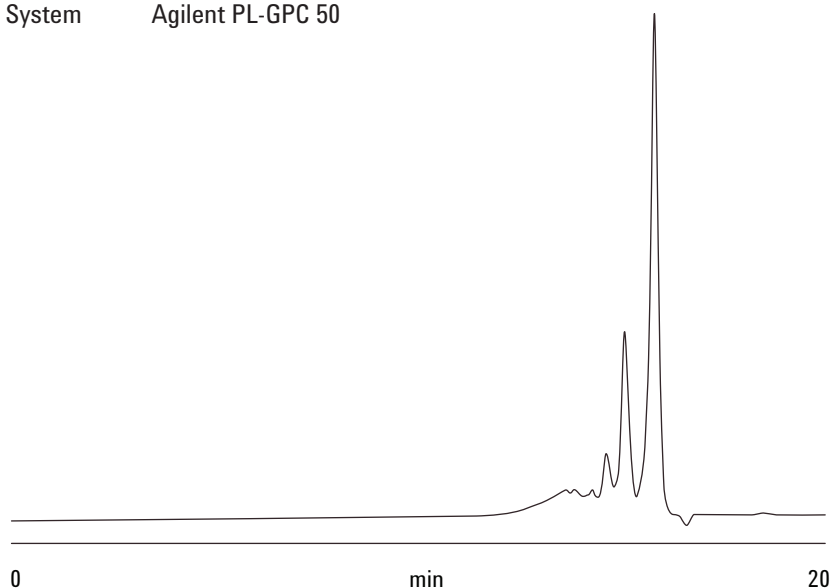


Figure 1. Oligomeric components of a prepolymer on Agilent PLgel MIXED-E columns.

## Conclusions

The analysis of low molecular weight prepolymers by gel permeation chromatography using Agilent PLgel 3  $\mu$ m MIXED-E columns allows a detailed investigation of the oligomeric components of the sample to be determined.

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