

# GPC and Agilent PolarGel-M Columns for the True Representation of Novolac Resins

## Application Note

### Authors

Greg Saunders, Ben MacCreath  
Agilent Technologies, Inc.

### Introduction

Novolac resins are thermoplastic materials made with an excess of phenol in an acid catalyzed reaction with formaldehyde. Novolacs are commonly employed as photoresists (light-sensitive materials used to form patterned surface coatings) and in varnishes. They have higher heat distortion temperatures and tend to be more expensive than regular epoxy resins.



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## GPC Analysis

PolarGel-M GPC columns are packed with low swell, macroporous copolymer beads that have a surface of balanced polarity, comprising hydrophobic and hydrophilic components. These allow PolarGel-M to be used in the analysis of high polarity polymers that are insoluble in water to give a more accurate representation of the molecular weight distribution of the polymer. If these polar polymers were to be analyzed with traditional styrene/divinyl benzene columns, interactions would cause artifacts in the peak shape and longer retention times, which would translate into apparently much lower molecular weight averages.

## Sample Preparation

Two novolac resins were analyzed to obtain an indication of differences in molecular weight, if any. The samples were made up at 0.2 % (w/v) in DMSO, with 0.1 % LiBr added to reduce sample aggregation, and injected without further treatment.

### Conditions

Columns: 2 x PolarGel-M, 300 x 7.5 mm (p/n PL1117-6800)  
Eluent: DMSO & 0.1 % LiBr  
Flow Rate: 1.0 mL/min  
Injection Volume: 100  $\mu$ L  
Temperature: 50  $^{\circ}$ C  
Detectors: Agilent PL-GPC 50, RI

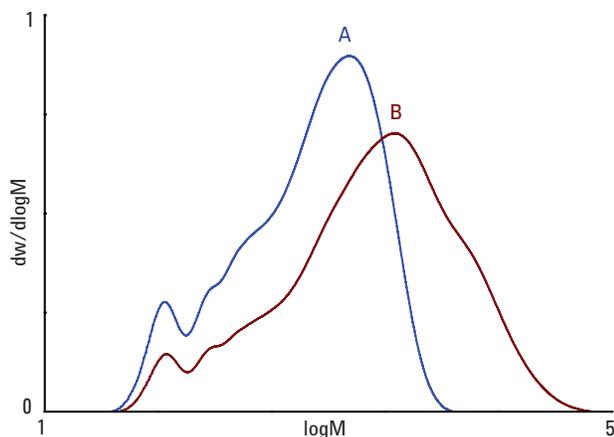


Figure 1. Overlaid molecular weight distributions of two novolac resins

## Results

Figure 1 shows the overlaid molecular weight distributions of two novolac resins.

## Conclusion

GPC with PolarGel-M columns allows for the artifact, interaction free calculation of the composition and molecular weight distributions of novolac resins that are difficult to analyze on traditional, organic (PS/DVB) GPC columns.

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