Phenol formaldehyde (P-F) resins are thermoplastic materials made with an excess of phenol in an acid catalyzed reaction with formaldehyde. P-F resins are commonly used as precursors to varnishes and other surface finish products.
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 types of phenol-formaldehyde resin were analyzed to obtain an indication of differences in molecular weight, if any. The samples were made up in 0.2 % (w/v) DMF, 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: DMF & 0.1 % LiBr
Flow Rate: 1.0 mL/min
Injection Volume: 100 µL
Temperature: 50 ºC
Detectors: Agilent PL-GPC 50, RI

Conclusion

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