

Polyether Ether Ketones on Agilent PLgel MIXED-B with Gel Permeation Chromatography

Application Note

Materials Testing and Research

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Introduction

Polyether ether ketone (PEEK) was developed in 1977 by ICI and was one of the first of the new generation of engineering thermoplastics developed for chemical resistance, high mechanical strength and high thermal stability. The useful properties of the material are retained up to 315 °C. A crystalline material with repeat units of two ethers and a ketone group in the polymer backbone, PEEK is a high cost material. For many applications, such as the manufacture of piston components in engines, the insulation of cables and the production of high performance aircraft parts, this cost is justified as there are no other plastics that can offer the same performance properties. The industrial performance of PEEK makes analysis of this material by gel permeation chromatography (GPC) difficult. PEEK has excellent chemical resistance and is unaffected by many organic and inorganic chemicals, dissolving only in strong or concentrated anhydrous oxidizing agents. Previous methods for analyzing PEEK have involved mixtures of trichlorobenzene and phenol running at high temperatures. In this example, we use chloroform and dichloroacetic acid to achieve a good result.



PEEK Analysis

For this analysis, the PEEK sample was dissolved in a small volume of dichloroacetic acid at 120 °C for two hours. After dissolution, the sample was diluted to the required concentration of 0.2% (w/v) with chloroform and injected into the GPC system running at temperature after filtration to remove un-dissolved material.

Conditions

Columns	2 × Agilent PLgel 10 µm MIXED-B, 7.5 × 300 mm (p/n PL1110-6100)
Eluent	80% Chloroform + 20% dichloroacetic acid
Flow rate	1.0 mL/min
Inj vol	200 µL
Detector	RI

Figure 1 shows a chromatogram of the PEEK sample, which eluted as a broad polymer peak with an Mw of 70,000 g/mol and a polydispersity of 2.2. The large system peak observed at the end of the run was due to the excess dichloroacetic acid used in the preparation of the sample.

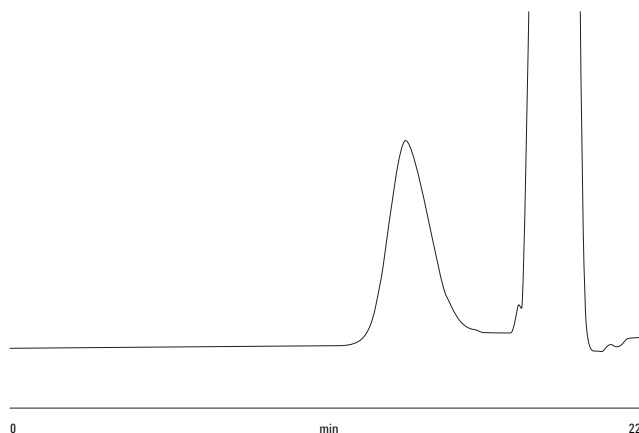


Figure 1. Molecular weight distribution of a polyether ether ketone on an Agilent PLgel MIXED-B two-column set.

Conclusion

These data show how PLgel columns can be used in very aggressive solvents to successfully analyze difficult samples such as PEEK 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.

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