Effective Analysis of Plasticizers by GPC and Evaporative Light Scattering Detection

Application Note

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Introduction

A common application for GPC is the analysis of polymers that contain plasticizers, where the polymer molecular weight distribution is to be determined as well as some qualitative information about the additives.

RI is often used for separation of additives, however, the Agilent ELSD is a good alternative for this application since it provides the benefit of significantly improved signal to noise ratio as the detector response is almost independent of dn/dc effects.

The PLgel 5 µm MIXED-C columns, with their high efficiency (>50,000 plates/meter) and broad resolving molecular weight range (up to 2,000,000 daltons relative to polystyrene), are the columns of choice for mid molecular weight polymers and demanding eluents.

Identification of the plasticizer dibutylphthalate reveals that the combination of PLgel 5 µm MIXED-C columns with the Agilent ELSD provides a good system for the discrimination of polymers and additives.

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Instrumentation

Column: PLgel 5 µm MIXED-C, 300 x 7.5 mm (p/n PL1110-6500)
Detector: Agilent ELSD (neb=40 °C, evap=90 °C, gas=1.5 SLM)

Materials and Reagents

Eluent: THF

Conditions

Flow Rate: 1.0 mL/min

Results and Discussion

Figures 1 and 2 show chromatograms from the analysis of a polymer containing dibutylphthalate (DBP) using RI and ELS detection. With relatively gentle evaporation conditions, the DBP is easily recovered from the system permitting identification and possibly quantification through calibration of peak response factor, although the more volatile toluene added as a flow rate marker is lost with the ELS.

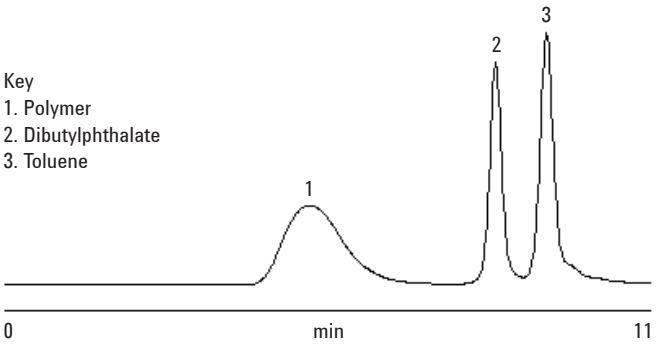

Figure 1. Separation of polymer containing dibutylphthalate using RI.

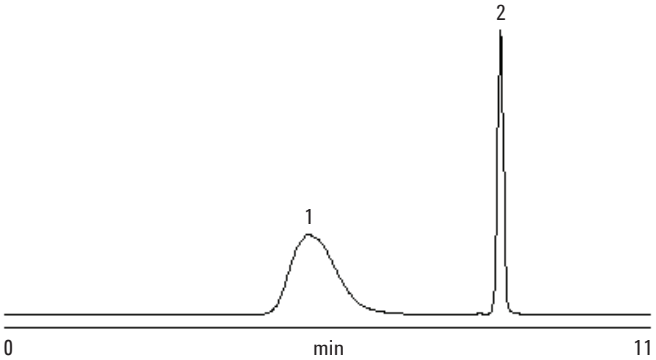

Figure 2. Separation of polymer containing dibutylphthalate using the Agilent ELSD.

Conclusion

PLgel columns and the Agilent ELSD provide a good combination for the separation of polymer additives because of the system's very low signal to noise ratios and excellent base line stability.

Mixed pore size PLgel columns offer high resolution over a specific molecular weight range. The robust design of the Agilent ELSD allows the nebulizer and evaporator to operate at very high temperatures, efficiently handling the high boiling point solvents that other ELSDs simply cannot manage.

PLgel columns and the Agilent ELSD are well suited to the separation of compounds that have no chromophores, under isocratic or gradient conditions.

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