Sensitive Analysis of Styrene Butadiene Rubber by GPC with ELSD

Application Note

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Introduction

Commercial grades of styrene butadiene rubber (SBR) can contain very high molecular weight fractions and therefore, for successful GPC separations, the sample concentration must be minimized in order to avoid viscous streaming effects. Some grades of SBR can also contain low molecular weight mineral oil as a modifier (so-called oil extended grades) that can be resolved from the polymer peak, thus permitting quantification using the Agilent ELSD.

The Agilent ELSD is a good choice 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 20 µm MiniMIX-A columns, with their high efficiency (>17,000 plates/meter) and broad resolving molecular weight range (up to 40,000,000 daltons relative to polystyrene), are the columns of choice for ultra high molecular weight polymers. Identification of styrene butadiene rubber reveals that the combination of PLgel MiniMIX-A columns with the Agilent ELSD comprises an excellent system for the discrimination of polymers and additives.

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Instrumentation

Columns: 2 x PLgel 20 µm MiniMIX-A, 250 x 4.6 mm (p/n PL1510-5200)
Detector: Agilent ELSD (neb=45 °C, evap=90 °C, gas=0.7 SLM)

Materials and Reagents

Eluent: THF

Conditions

Flow Rate: 0.3 mL/min
Loading: 1 mg/mL, 100 µL

Results and Discussion

The high sensitivity of the Agilent ELSD permitted the polymers to be chromatographed at low loadings using the narrow bore PLgel 20 µm MiniMIX-A columns, as shown in Figure 1.

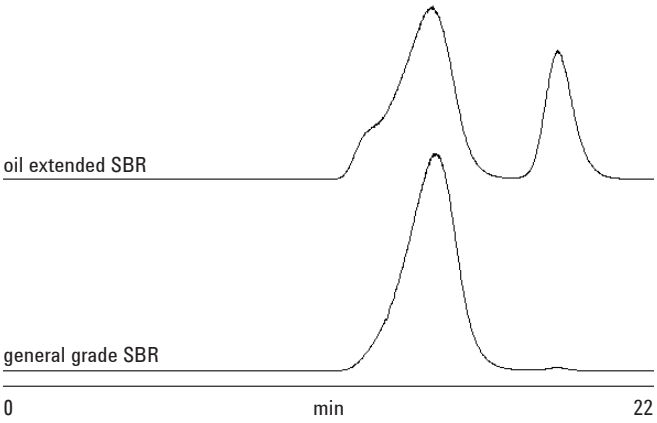

Figure 1. Oil extended SBR (above) and general grade SBR with no oil modifier (below), as revealed by the Agilent ELSD.

Conclusion

PLgel 20 µm MiniMIX-A columns and the Agilent ELSD provide an excellent combination for the separation of styrene butadiene rubber 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. In addition, the MiniMIX variants permit low column loadings. 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 Agilent ELSD are well suited to the separation of compounds that have no chromophores, under isocratic or gradient conditions.

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