ApplicationNOTE

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2420 EVAPORATIVE LIGHT SCATTERING DETECTOR: ANALYSIS OF POLYETHYLENE GLYCOL

Andrew Aubin, Principle Applications Chemist, Waters Corporation

Introduction

Polyethylene glycols (PEG) are non-ionic, water-soluble polymeric materials that are used widely as ingredients or intermediate components in a wide-range of industries and applications. Typically, readily purchasable PEG samples consist of many component oligomers, which combined, give the average molecular weight usually indicated by a number following the name (example: PEG 400).

Chromatographic analysis of PEG can be accomplished by gel permeation chromatography (GPC). GPC analysis does not resolve the individual component oligomers, but will give average molecular weight information. In order to separate the individual component oligomers, reversed phase gradient elution chromatography must be employed. Analysis of PEG presents a further challenge involving detection. As PEG has no chromophores, UV detection cannot be used except at very low wavelengths or after derivatization. PEG can be detected using refractive index detection (RI), but is limited to isocratic HPLC methods, making separation of individual component oligomers very difficult. Evaporative light scattering (ELS) will detect polyethylene glycols, and is a detection technique that is compatible with reversed phase gradient chromatography.

Experimental

Commercially available polyethylene glycols (PEG 400, PEG 600, and PEG 960) were dissolved in methanol/water (1:1) to a concentration of 1 mg/mL. Replicate injections (10 µL) of each sample were separated using the same linear gradient (see Gradient Table) on a 4.6 X 150 mm Waters® XTerra® RP8 column, 3.5 µm (p/n 186000443) heated to 60 °C using the following system: Waters Alliance® 2695 Separations Module, Waters 2420 ELS Detector (drift tube temp. 50 °C, nebulizer heater at 50%, nebulizer nitrogen gas pressure at 50 psi). All instruments were controlled and data collected and analyzed using Empower™ software.

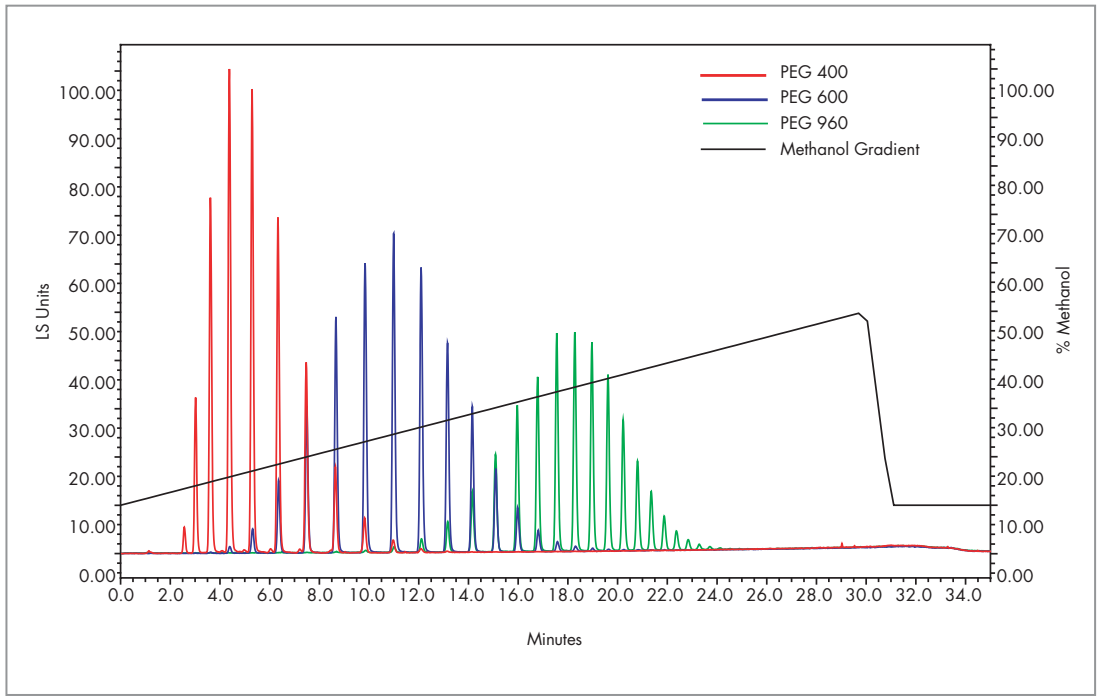

Figure 1 – Overlay of PEG 400, 600, 960 Separations

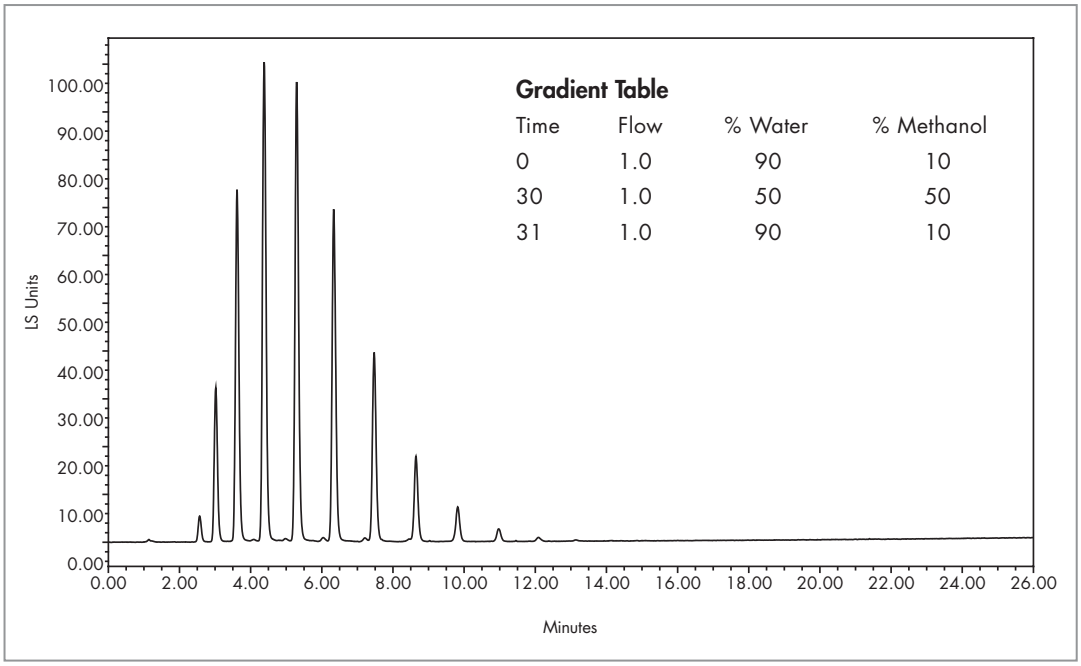

Figure 2 – Separation of PEG 400

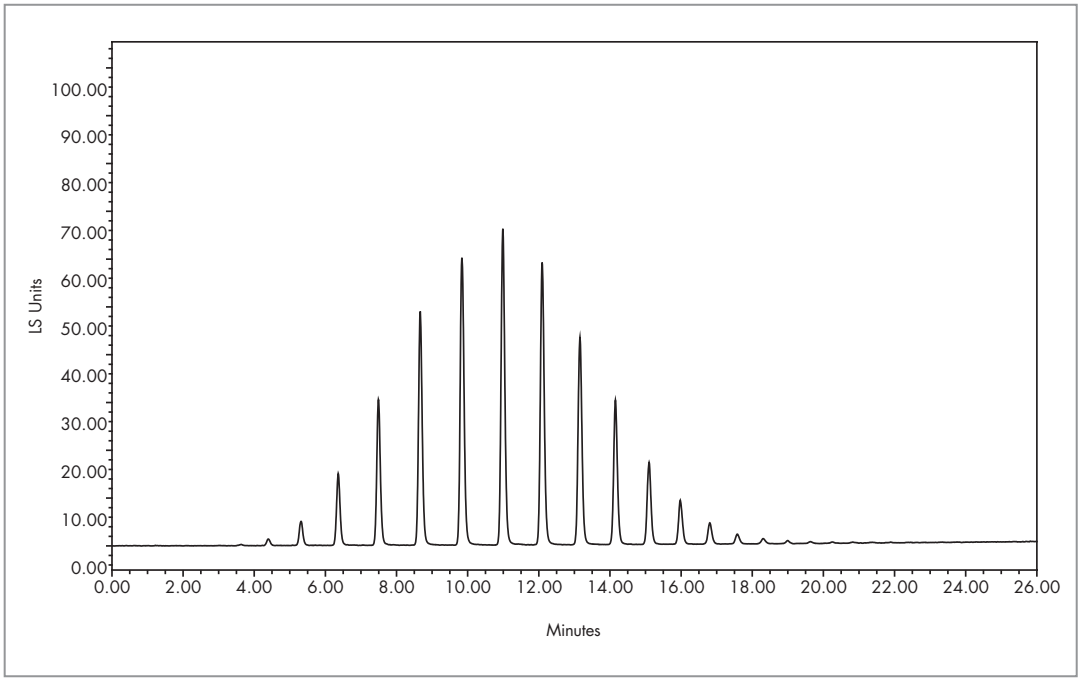

Figure 3 – Separation of PEG 600

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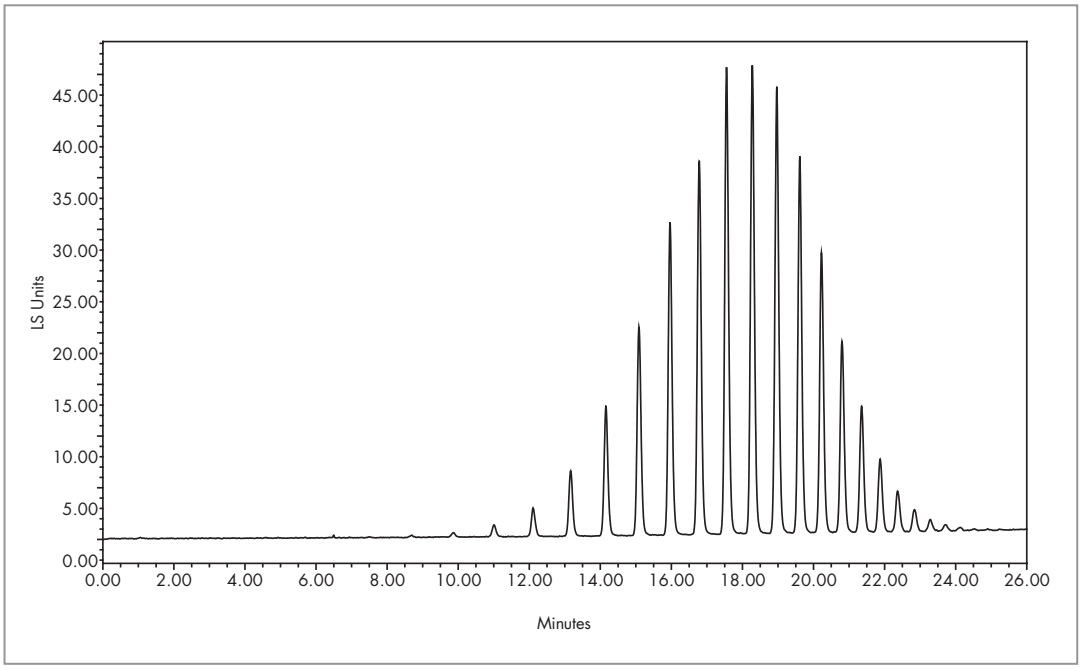

Figure 4 – Separation of PEG 960

Results

Figure 1 shows an overlay chromatogram of the 3 different PEG samples and the gradient slope profile. The XTerra column combined with this water/ methanol gradient was successful at achieving separation of the individual components of each sample regardless of the average molecular weight. Figures 2-4 show the separation of PEG 400, 600 and 960 respectively. The Waters 2420 ELSD easily detected these challenging samples with good sensitivity and reproducibility.

Conclusions

Waters 2420 Evaporative Light Scattering Detector can detect polyethylene glycol (PEG) under reversed phase gradient conditions.

Reversed phase gradient chromatography combined with evaporative light scattering detection is an excellent technique to monitor the quality of PEG, providing better resolution of component oligomers than traditional GPC analysis.

Different average molecular weight samples of PEG can be analyzed using the same conditions and compared.

WATERS CORPORATION
34 Maple St.
Milford, MA 01757 U.S.A.
T: 508 478 2000
F: 508 872 1990
www.waters.com

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