



SEC Analysis of Star Branched Polyethylene Glycol without Column Interaction

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Introduction

Recent advances in polymer chemistry have led to the development of novel materials with both controlled functionality and structure resulting in unusual rheological properties. Examples include the many di- and triblock copolymer architectures and dendritic systems. These materials often include regions of different polarity and hydrophobicity and therefore represent a challenge to the analytical chemist. This application note illustrates the analysis of a star-branched polyethylene glycol with a significant hydrophobic component by aqueous SEC.

The basic structure of the star-branched polyethylene glycol is shown in Figure 1, where R represents an aromatic hydrophobic component. Unmodified polyethylene glycol can be analyzed in aqueous solution at pH 7. However, the star-branched material contained a significant hydrophobic component that could interact with the column packing material resulting in non-SEC effects.

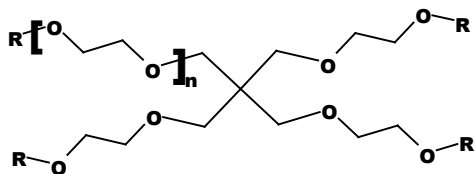


Figure 1. Structure of the star-branched polyethylene glycol.

To investigate the effect of the hydrophobic component on the elution profile, the sample was analyzed in buffer at pH 7 both before and after the inclusion of 30% methanol (by volume). The presence of a miscible organic solvent such as methanol significantly lowers the polarity of the eluent and serves to minimize hydrophobic interactions between the sample and column packing material. PL aquagel-OH columns were chosen because they can be used with up to 50% methanol in the eluent. These high performance columns operate across a wide range of eluent conditions for high performance analysis of analytes with neutral, ionic and hydrophobic moieties, singly or combined.

Conditions

Samples: Star branched PEG
Columns: 2 x PL aquagel-OH 30 8 μm , 300 x 7.5 mm
Eluent: Water + 0.2 M NaNO_3 + 0.01 M NaH_2PO_4 + 30 % methanol
Flow Rate: 1.0 mL/min
Injection Volume: 100 μL
Detection: RI

Results and Discussion

The resulting chromatograms are shown in Figures 2 and 3.

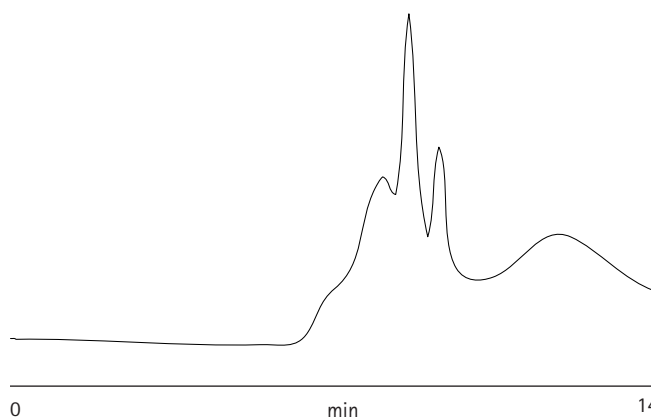


Figure 2. Chromatogram of the star-branched polyethylene glycol obtained in buffer at pH 7.

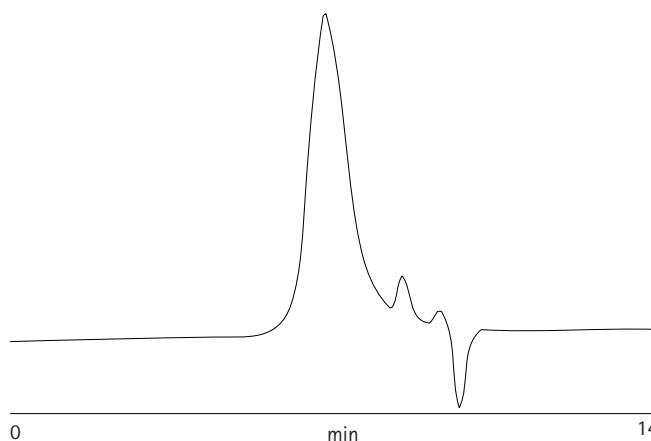


Figure 3. Chromatogram of the start-branched polyethylene glycol obtained in buffer at pH 7 with 30 % methanol.

Clearly, the chromatogram obtained without methanol shows that the sample is interacting strongly with the column, with some material eluting after the total permeation limit. However, the presence of 30% methanol has inhibited the interaction and a normal Gaussian peak shape has been obtained, which can be integrated for SEC calculations.

Conclusion

The presence of significant hydrophobicity in a star branched polymer is no barrier to its resolution by SEC with PL aquagel-OH columns. In addition, the column's ability to handle eluents containing up to 50% methanol means that star-branched polymers can be resolved without interactions.

These data represent typical results. For further information, contact your local Varian Sales Office.

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