Size Exclusion Chromatography for the Analysis of Dental Polymers

Application Note

Author

Greg Saunders, Ben MacCreath
Agilent Technologies, Inc.

Introduction

Copolymers of vinylmethyl ether and maleic anhydride are widely used in a range of dental applications. These include their use as a denture bioadhesive, as well as a toothpaste additive which helps the toothpaste to remain active between brushing. Batch to batch variations of such copolymer systems strongly influence performance in dental applications. Here, two batches of a commercial copolymer were analyzed by size exclusion chromatography (SEC). One of them had worked well in formulation but the other had failed.

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Materials and Methods

A column set comprising 2 x Agilent PL aquagel-OH MIXED 8 µm columns were used for the analysis. These versatile columns offer resolution over a wide range of molecular weight (up to 10,000,000 relative to PEG/PEO), simplifying column selection. Column calibration was achieved using Agilent EasiVial PEG/PEO standards. EasiVials provide a rapid and convenient means of constructing an aqueous SEC column calibration curve over a wide molecular weight range (typically 100 to 1,200,000 g/mol). The samples were made up in sodium nitrate buffer at neutral pH.

Conditions

Samples: Two samples of dental polymers
Columns: 2 x PL aquagel-OH MIXED 8 µm, 300 x 7.5 mm (p/n PL1149-6800)
Eluent: 0.2 M $NaNO_3$ + 0.01 M NaH_2PO_4 at pH 7
Flow Rate: 1.0 mL/min
Detection: Agilent PL-GPC 50 Plus (DRI)

Results and Discussion

Figure 1 shows the Agilent EasiVial PEG/PEO calibration curve. Figure 2 shows overlaid raw data chromatograms for the two batches, indicating large differences in molecular weight and molecular weight distribution.

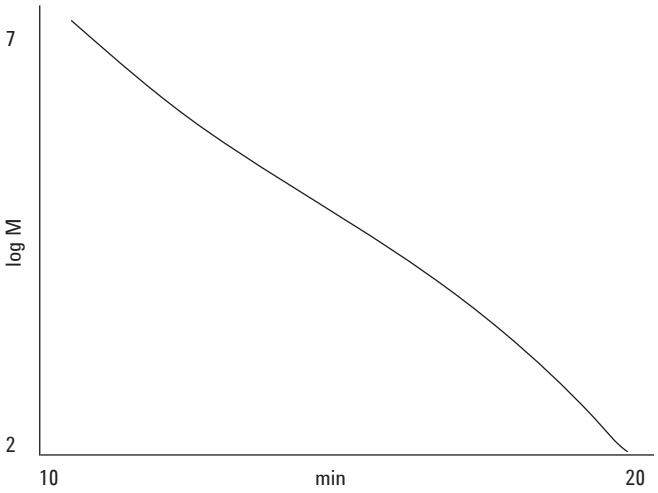

Figure 1. SEC PEG/PEO calibration using EasiVial standards

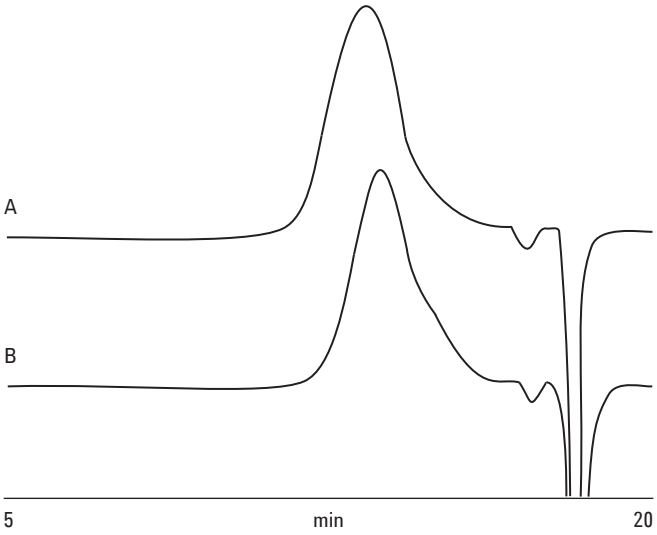

Figure 2. Raw data chromatograms of two dental polymers

The molecular weight distribution plots are presented in Figure 3 and clearly indicate the differences between the two batches.

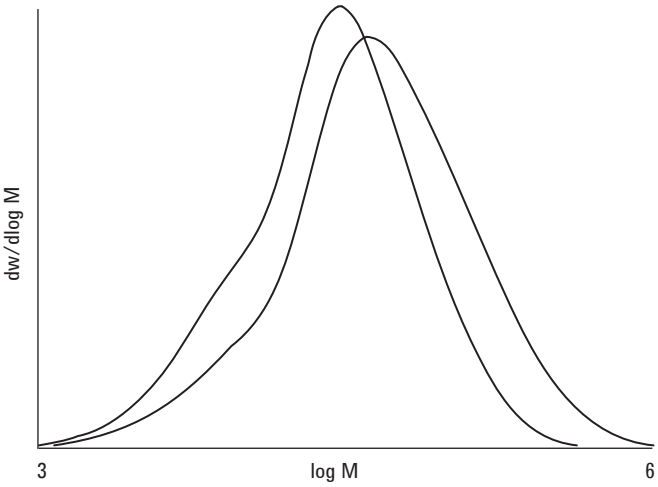

Figure 3. Overlay of the molecular weight distributions of two dental polymers

Table 1. Mp, Mw, Mn and polydispersity values for the two dental polymers

Batch	Mp	Mw	Mn	Polydispersity
A	169,330	100,070	258,200	2.6
B	124,100	69,550	152,060	2.2

Conclusion

Size exclusion chromatography using the PL-GPC 50 Plus in combination with PL aquagel-OH MIXED 8 µm columns was able to distinguish between successful and failed batches of copolymer for a dental application, illustrating the usefulness of the system for the quality control of polymers.

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This information is subject to change without notice.

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