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Application Note SI-02022

## Analysis of Linear and Branched Polyethylene Glycols via GPC Viscometry

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### Introduction

Polyethylene glycol is a biocompatible polymer used in many different commercial products because of its low toxicity. It forms the basis of many cosmetic materials and lubricants. More recently, through its conjugation to different protein and therapeutic materials, it finds use in a variety of biomedical application areas. The biomedical interest in branched type PEG materials has increased as a result of their lower viscosity in comparison with equivalent linear type polymers. Investigation of PEGs by GPC can be used to elucidate their relatively compact nature in solution.

### Methods and Materials

Analysis of low molecular weight polyethylene materials is easily achieved by gel permeation chromatography with high efficiency PLgel 5  $\mu\text{m}$  MIXED-D (300 x 7.5 mm) columns and the PL-GPC 50 Plus instrument, all from Varian. The PL-GPC 50 Plus was equipped with both differential refractive index and viscometry detection. The PEG samples were prepared at 0.2% (w/v) in dimethylformamide at room temperature for 2 hours and injected without further treatment.

Sample: Polyethylene  
Column: 2 x PLgel 5  $\mu\text{m}$  MIXED-D (300 x 7.5 mm)  
Eluent: Dimethylformamide (+ 0.1% LiBr)  
Flow Rate: 1.0 mL/min  
Inj Vol: 100  $\mu\text{L}$   
Sample Conc: 2.0 mg/mL  
Temp: 50 °C  
Calibrants: EasiVial™ PEG/PEO  
Detector: PL-GPC 50 (Differential Refractive Index + PL-BV 400RT Viscometer)

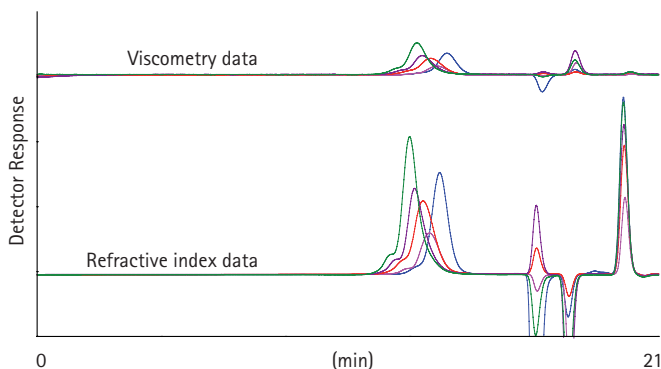


Figure 1. Overlaid raw data chromatograms obtained from a series of linear and branched polyethylene glycol samples.

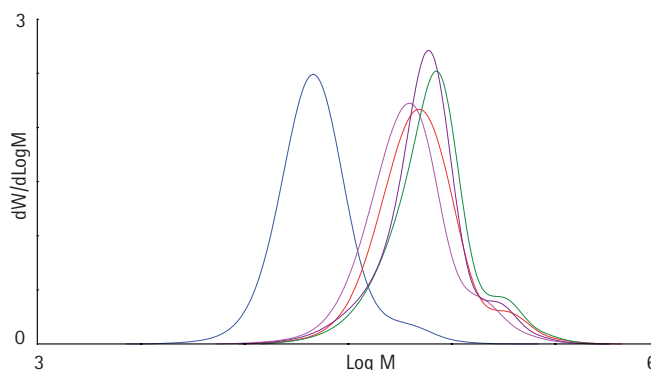


Figure 2. Overlaid molecular weight distributions obtained from a series of linear and branched polyethylene glycol samples.

### Results

Figure 1 shows the overlaid chromatograms given by the samples and Figure 2 the calculated molecular weight distributions.

### Conclusion

This investigation demonstrates how gel permeation chromatography with viscometry detection, delivered by the PL-GPC 50 Plus and PL-BV 400RT, can be used for the analysis of pharmaceutically and commercially interesting materials such as linear and branched polyethylene glycols.

*These data represent typical results.  
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