



Analysis of Modified Polyacrylamide by Aqueous SEC with Triple Detection

Application Note

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Introduction

Polyacrylamides find many commercial uses, mainly in water treatment, pulp and paper production and mineral processing. These applications rely on the polymer's ability as a flocculant. Supplied in dry or liquid form, the most common liquid polyacrylamide is available as an emulsion with 10-40 % actives in a carrier fluid containing surfactants and latex. These emulsion polymers require activation to invert the emulsion and allow the electrolyte groups to be exposed.

A sample of a modified polyacrylamide was analyzed by triple detection in order to obtain an accurate molecular weight for the material, a critical parameter controlling flocculation properties. An integrated GPC system was used for the analysis.



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Instrumentation

The polyacrylamide was assessed by an Agilent PL-GPC 50 Plus with differential refractive index detector, Agilent PL-BV 400RT viscometer, Agilent PL-LS 15/90 dual angle light scattering detector and Agilent PL aquagel-OH MIXED-H 8 μm columns. These columns provide high resolution over a very wide range of molecular weights, simplifying column selection and producing a versatile analytical system.

Columns: 2 x PL aquagel-OH MIXED-H 8 μm , 300 x 7.5 mm
(part number PL1149-6800)

Materials and Reagents

Samples: Polyacrylamide
Eluent: 0.2 M NaNO_3 + 0.1 M NaH_2NO_3 , pH 7

Conditions

Flow Rate: 1 mL/min
Temperature: 40 $^\circ\text{C}$
Injection Volume: 100 μL

Results and Discussion

Using triple detection, the sample could be analyzed without the need to perform a column calibration (Figure 1). The triple detection molecular weight distribution for the sample appeared Gaussian (Figure 2) and the linearity of the Mark-Houwink plot indicated that the material had a uniform structure across the majority of the molecular weight range (Figure 3).

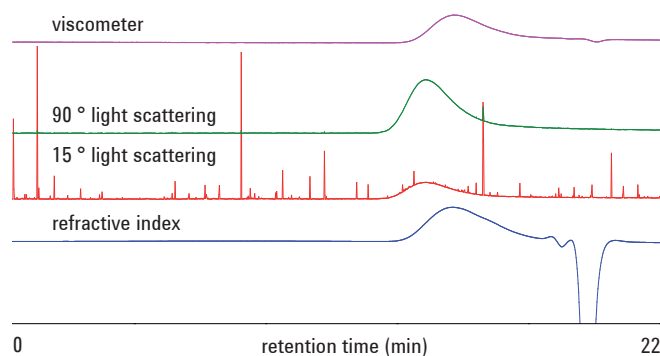


Figure 1. Raw triple detection data for a polyacrylamide

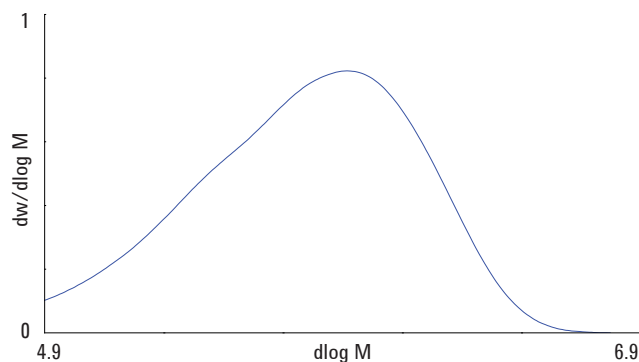


Figure 2. Triple detection molecular weight distribution for a polyacrylamide

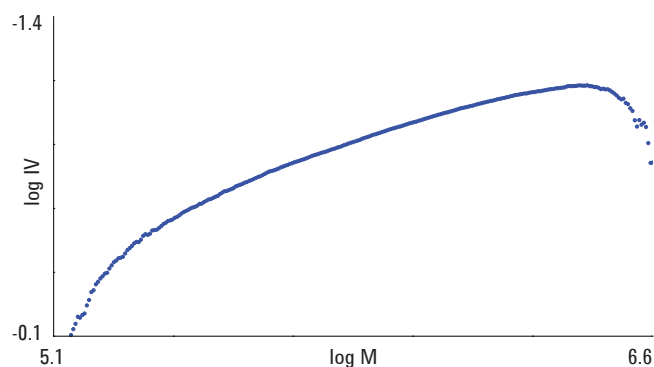


Figure 3. Mark-Houwink plot for the polyacrylamide

Conclusion

The PL-GPC 50 Plus is a high resolution, cost effective integrated GPC system designed for operation from ambient to 50 $^\circ\text{C}$. The standard system comprises precision solvent delivery, sample injection, high performance differential refractive index detection and a column oven, with fully integrated software control. When coupled with PL aquagel MIXED-H 8 μm columns, a PL-BV 400RT viscometry detector and a PL-LS 15/90 dual angle light scattering detector, the PL-GPC 50 Plus uses triple detection for the accurate determination of polymer molecular weights.

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