Analysis of Modified Polyacrylamide by Aqueous SEC with Triple Detection

Application Note

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.
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 NaNO₃ + 0.1 NaH₂PO₄, pH 7

Conditions

Flow Rate: 1 mL/min
Temperature: 40 °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).

Conclusion

The PL-GPC 50 Plus is a high resolution, cost effective integrated GPC system designed for operation from ambient to 50 °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.