GPC Application Note #11

Advanced GPC Analysis of Poly(N-isopropylacrylamide)

Poly(N-isopropylacrylamide) (PNIPAm) is a temperature-responsive polymer that can be synthesized from N-isopropylacrylamide. It is synthesized via free-radical polymerization and is readily functionalized, making it useful in a variety of applications. The versatility of PNIPAm has led to uses in macroscopic gels, microgels, membranes, sensors, biosensors, thin films, tissue engineering, and drug delivery. The tendency of aqueous solutions of PNIPAm to increase in viscosity in the presence of hydrophobic molecules has made it excellent for tertiary oil recovery. The MWD and IV are key process control parameters in the production/application of PNIPAm. The following samples were analyzed using a Malvern Triple Detector GPC system. The analysis conditions are listed below.

Solvent	DMF + 0.02M LiBr		Sample Conc	2 mg/mL
Columns	2 X I-MBHMW-3078		Dissolution Temp	25C
Flow Rate	1 mL/min		Dissolution Time	60 Minutes
Column Temp	30C		Sample Filtration	0.2 um Teflon

Figure: Triple Chromatogram of a typical PNIPAm sample

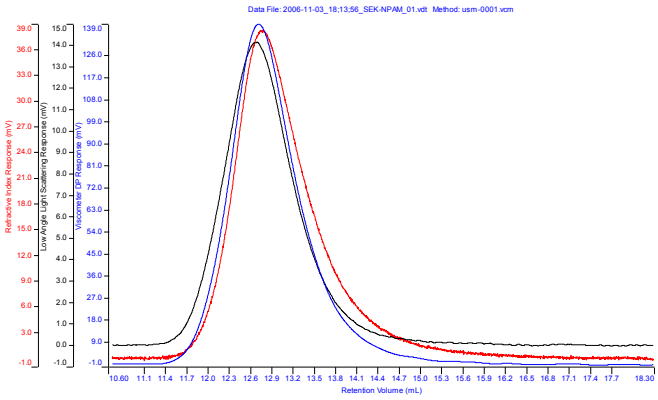

Table: Analysis Summary of typical PNIPAm samples

Sample Id	Mw	Mn	IV		Sample Id	Mw	Mn	IV
PNIPAm-1A	60,332	52,781	1.14		PNIPAm-2A	101,798	81,256	1.25
PNIPAm-1B	59,296	51,432	1.15		PNIPAm-2B	98,845	82,560	1.20
Average	59,814	52,107	1.15		Average	100,322	81,908	1.23
RSD	0.83%	2.37%	0.95%		RSD	1.72%	2.88%	0.76%

The results show consistent MWD and IV data for of two PNIPAm samples.