GPC Application Note #9

Advanced GPC Analysis of Polyacrylonitrile

Polyacrylonitrile (PAN) is a synthetic semicrystalline organic polymer. It is a versatile material used to produce a large variety of products, including ultra-filtration membranes and many different types of fibers. PAN fibers are the chemical precursor of high quality carbon fiber. PAN is first thermally oxidized in air at 230 °C to form an oxidized PAN fiber and then carbonized above 1000 °C in inert atmosphere to make carbon fibers found in a variety of both high-tech and common daily applications. The MWD and IV are key process control parameters in the production of PAN. 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 PAN sample

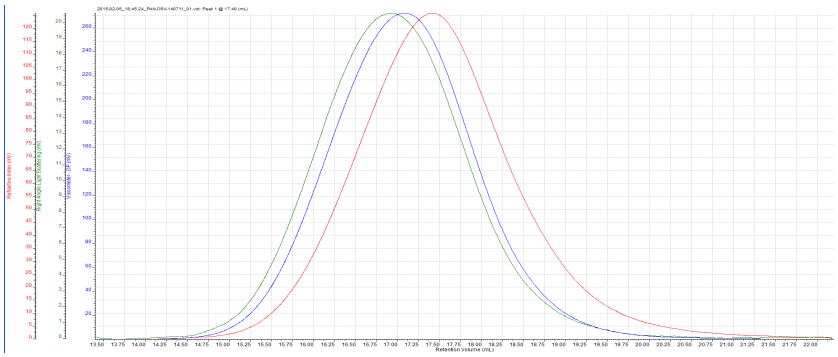

Table: Analysis Summary of typical PAN samples

Sample Id	Mw	Mn	IV		Sample Id	Mw	Mn	IV
PAN-1A	154,214	101,569	1.649		PAN-2A	307,084	188,711	2.158
PAN-1B	154,302	96,869	1.657		PAN-2B	317,358	193,251	2.191
PAN-1C	156,497	99,555	1.679		PAN-2C	309,627	199,818	2.172
Average	155,004	99,331	1.662		Average	311,356	193,927	2.174
SD	1,293	2,358	0.016		SD	5,351	5,584	0.016
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 PAN samples.