

Molecular mass determination of polyacrylonitrile by SEC

Polyacrylonitrile (PAN) is a polymer that provides excellent chemical resistance and an outstanding barrier to gas permeation. Polyacrylonitrile is used as a packaging material for foods, pharmaceuticals, cosmetics, and other chemical products, and also as containers for transporting electronic components. It has also recently attracted attention as an ingredient in carbon fiber.

We present here the results of our investigation of the molecular mass of PAN using GPC. Because of its dissolving properties, DMF is used as the eluent in the GPC analysis of PAN. We selected the TSKgel SuperAWM-H semi-micro column for this investigation as TSKgel SuperAW columns are physically stable in a broad range of polar organic solvents. For this application we used the EcoSEC® GPC system, a high-speed GPC system that is compatible with semi-micro columns.

Figure 1 shows that PAN elutes from the column with good peak shape and in a short analysis time. Due to the small particle size of the TSKgel SuperAWM-H when compared to conventional size columns (7.8mm ID x 30cm), the same analysis can be accomplished in half the time. By adjusting the data collection time (here only data between 5 and 17 minutes is collected), a single analysis can be run in about 12 minutes. Table 2 shows the results of weight-average molecular weight analysis. Analyses were conducted 5 times daily for 3 days. Within-day reproducibility was approximately 0.6% to 1.4% and between-day reproducibility over 3 days was approximately 1%.

When using a TSKgel SuperAWM-H column in combination with the EcoSEC GPC system, molecular mass determination of PAN can be conducted rapidly and with good reproducibility.

Table 1. Conditions

Column:	TSKgel SuperAWM-H, 9µm, 6.0mm ID x 15cm x 2
Mobile phase:	10mmol/L LiBr in DMF
Flow rate:	0.6mL/min
Detection:	RI
Temperature:	40°C
Injection vol.:	20µL
Sample:	polyacrylonitrile (0.2 wt%)
Mw standard:	polystyrene
Instrument:	EcoSEC GPC System

Figure 1. Chromatogram of polyacrylonitrile (PAN)

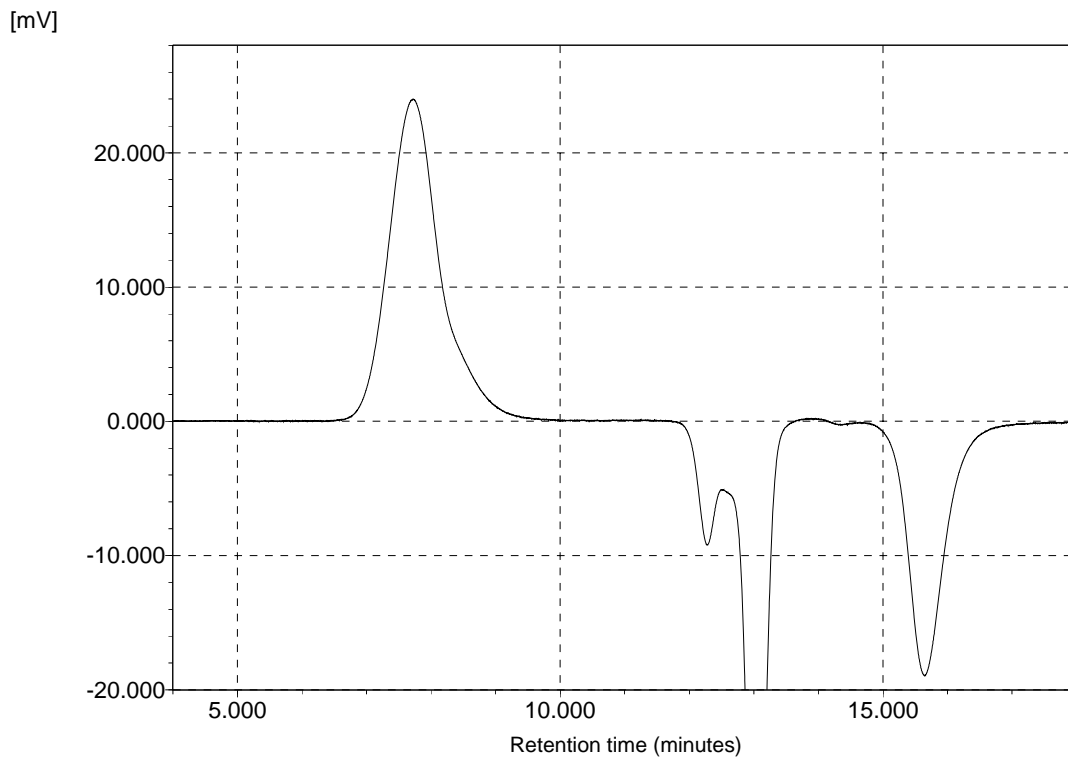


Table 2. Results of weight-average molecular weight analysis (polystyrene converted values)

	Day 1	Day 2	Day 3
1	4.19×10^5	4.11×10^5	4.03×10^5
2	4.20×10^5	4.07×10^5	4.10×10^5
3	4.12×10^5	4.10×10^5	4.15×10^5
4	4.15×10^5	4.08×10^5	4.16×10^5
5	4.20×10^5	4.14×10^5	4.17×10^5
AV	4.17×10^5	4.10×10^5	4.12×10^5
CV	0.91%	0.67%	1.41%



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