

Long-Term Reproducibility of SEC-MALS

The reproducibility of results generated in any analytical laboratory is one of the most important measures of the *quality* of work and the *reliability* of an analytical instrument's performance. Long-term reproducibility, for example, is extremely critical in manufacturing and quality control.

Reproducibility is often evaluated from multiple measurements performed *within* a single day. Favorable results from such measurements are reported by instrument manufacturers *without* mentioning the long-term changes of instrument performance and the influence of different laboratory conditions upon the results. In this application note, however, a *long-term* reproducibility study of an SEC-MALS method is reported based on the data collected at an independent analytical laboratory during a *five-year* period. To our knowledge, no similar studies have ever been performed on any other light scattering instruments.

Two light scattering detectors (DAWN-F and miniDAWN) were used for the characterization of a broad polystyrene sample. The measurements were carried out with different numbers of mixed-bed SEC columns over five years. THF was used (at a flow rate of 1 mL/min) as the mobile phase for all analyses. The laboratory temperature varied from 18 ° to 28 °C.

The molar mass averages are summarized in Table 1. The slope of the root mean square radius *versus* molar mass plot, an important characteristic of polymer conformation, is also listed in the table. Figure 1 illustrates an overlay of four cumulative distribution curves, measured at various dates with different numbers of columns. The data show excellent long-term reproducibility of molar mass and slope of the conformation plot.

No significant effects from the number of SEC columns and the MALS detector were observed—even over five years. The results suggest strongly that MALS detectors provide extraordinary reproducibility from day-to-day, month-to-month, and year-to-year, with minimal influence from the chromatographic conditions.

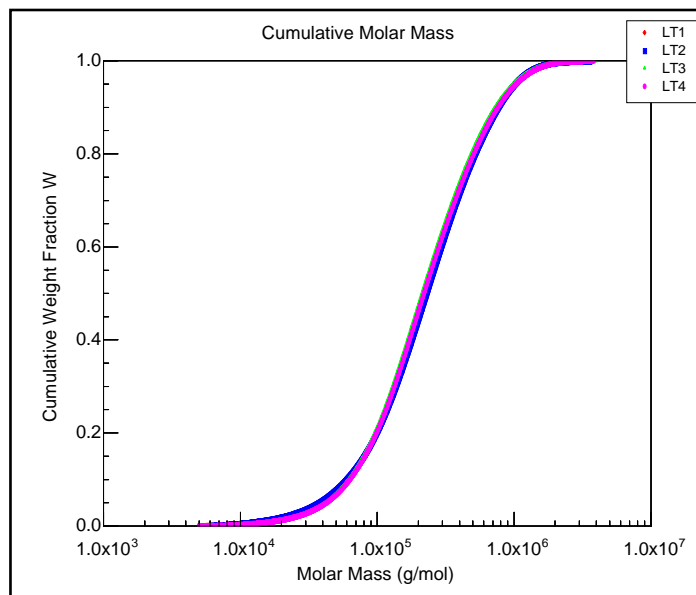
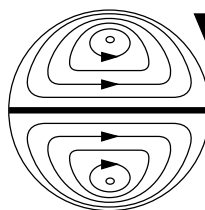


Figure 1. Overlay of 4 cumulative distribution curves measured during a 5-year period.

Date	No. of columns	M_n [10^3 g/mol]	M_w [10^3 g/mol]	slope
11/30/94	1 / D	125	336	0.54
2/16/95	1 / D	127	335	0.56
3/29/96	1 / D	133	330	0.55
7/10/96	2 / D	128	325	0.57
2/2/98	3 / D	127	335	0.56
2/24/98	3 / D	129	335	0.55
4/30/98	2 / D	124	334	0.57
12/16/98	3 / mD	128	335	0.58
12/19/98	2 / mD	131	339	0.57
12/21/98	1 / mD	135	341	0.58
4/1/99	2 / mD	138	332	0.56
4/23/99	2 / D	140	346	0.56
6/3/99	2 / mD	130	328	0.59
10/26/99	2 / mD	120	338	0.55
RSD [%]		4.2	1.6	2.5

Table 1. The summary of the molar mass averages obtained over the five year testing period.



**Wyatt
Technology**
CORPORATION

6300 Hollister Avenue • Santa Barbara, CA 93117

TEL (805) 681-9009 • FAX (805) 681-0123

E-mail: info@wyatt.com • URL: http://www.wyatt.com