TESTA ANALYTICAL SOLUTIONS e.K. • Sophienstraße 5 • 12203 Berlin

# BI-MwA*

## A new beginning

Characterizing dilute polymer solutions using static light scattering (SLS) has never been easier, more accurate, or a better value. The BI-MwA uses a 30 mW, 660 nm diode laser and 7 angles to determine the intensity of scattered light as a function of angle and polymer concentration. From this information one of three plots is constructed with the standard BI-MwAZP software: Zimm, Berry, or Debye. From such plots the weightaverage molecular weight, Mw, the root-mean-square radius (radius of gyration), Rg, and the second viral coefficient, A2, are calculated. The BI-MwA can be used in batch or flow mode, as a chromatography detector, or for following the kinetics of polymerization using TDSLS, time-dependent static light scattering. Best of all, the BI-MwA has the highest performance/price ratio of any light scattering detector used for Mw determination.

- $M_w$ of polamers
- Natural & syntethic
- Proteins
- Study aggregation

## Why seven angles?

A single, low angle is sufficient, theoretically, to determine Mw. However, calibration is still necessary without dust or flare light interfering. This requires an additional 90° measurement. At least two angles are required to determine Rg from a straight line fit. However, two points always determine a straight line, with no room for error. Therefore, three angles are the absolute minimum for a least squares fit. What if dust distorts one of the angular intensity values? What if more accuracy is required? For these reasons the standard BI-MwA optical configuration has seven angles. Other configurations are available on request.

*Source: https://www.brookhaveninstruments.com/pdf/Light%20Scattering/BI-MwA.pdf

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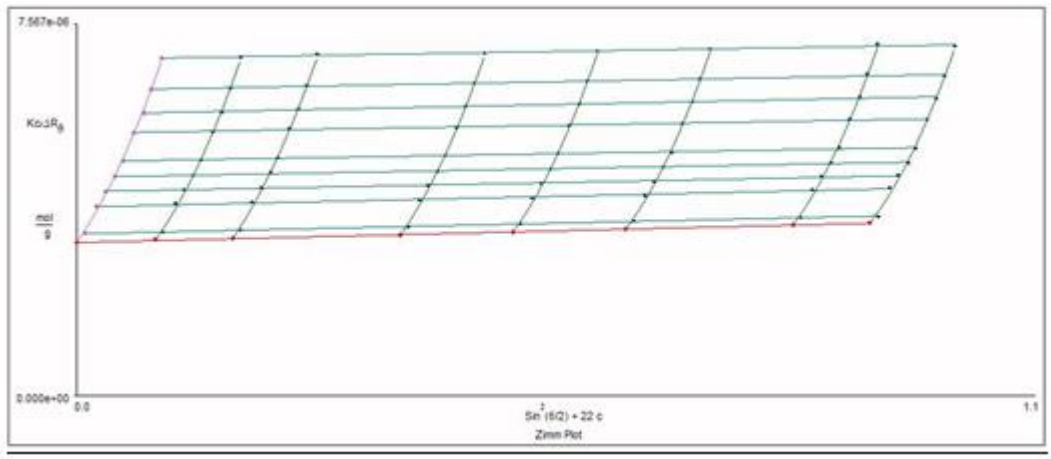


*Figure 1* *Static Light Scattering: Zimm Plot for Mw*

## Rugged Design, Small Footprint

About the size of a polymer handbook, the BI-MwA design avoids the pitfalls of similar machines. The flow path is vertical, not horizontal, avoiding trapped bubbles. There are no sharp corners inside the cell, only conical shapes. Previous solutions are more easily flushed. The cell can withstand much higher pressures than earlier instruments of this type, up to 3.5 MPa, minimizing the chance of an expensive repair.

## Unique Microcontroller and Detector Design

The unique microcontroller used in the BI-MwA supports four analog inputs as standard, 16 optional, all with 24-bit resolution. Two-way communication is possible using a USB port. The BI-MwA is completely re-programmable via flash memory. In this way, as requirements change, so does the instrument with a minimum of effort. The ultra-sensitive CCD detector is uniform in its response, and, coupled with the microcontroller, allows for automatic gain adjustment over many decades of scattered intensity. The cell can withstand much higher pressures than earlier instruments of this type, up to 3.5 MPa, minimizing the chance of an expensive repair.

## Applications

The BI-MwA is ideal for studying synthetic and natural polymers in solution, including proteins and polysaccharides. Investigate oligomerization, complex formation, aggregation, stability, and conformation. SLS is an absolute technique for $M_w$ determination; whereas, viscosity measurements require calibration and too many assumptions about the polymer/solvent system that may not be true in a particular case. Even shape may be determined in some cases by plotting log $M_w$ vs log $R_g$. The slope of the line can indicate whether the molecule is coiled, rod-like, or spherical.

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# Specifications*

## Cell & Optics

| | |
|---|---|
| Angles | 7, nominally 35, 50, 75, 90, 105, 130, and 145, plus a reference angle |
| Fiber | Low numerical aperture, integral to cell |
| Back Pressure | 3.5 MPa (500 psi) maximum |
| Fittings | Standard HPLC inlet/outlet panel |
| Volume | Cell, 100 µL nominal; scattering, 20 nL nominal |
| Laser | Nominal 30 mW, 637 nm, vertically polarized |
| Cell | PET standard, options by request |

## Electronics & Detector

| | |
|---|---|
| Control | Integrated, dedicated, powerful microcontroller |
| Detector | CCD, ultra-high sensitivity and spatial uniformity |
| Inputs | 4 standards with 16 to 24 bit resolution, 15 optional with 24 bit resolution; computer selectable gain; suitable for use with most common RI, UV, and viscometer, thermocouple, thermistor, injector, pressure gauge, and pump outputs |
| Power Requirements | 100/115/220/240 VAC, 50/60 Hz 25 watts |
| Dimensions | 195 x 210 x 380 HWD in mm |
| Weight | 5.5 kg |
| Options | BI-TDLS Software for monitoring polymerization kinetics |

*A policy of continual improvement may lead to specification changes

**Polymer science at work**