

A Better Way to Measure Molecular Weight and Intrinsic Viscosity

The automated viscometer for all your viscosity measurement and average molecular weight analyses needs.



The solution to your many challenges.

Problem	miniPV solution
Time consuming manual measurements	Automated
Volatiles	Sealed measurements
Cumbersome correlations to IV	Direct IV
Struggling to determine accurate MW	4x more accurate MW determination
Viscosity accuracy	0.36 %
Deterred by PCR contaminant levels	Unaffected by PCR contaminants
Hygroscopic samples	Unaffected by moisture
Fillers limiting accurate analyses	Unaffected by fillers
Chemical compatibility limiting analyses	Compatible with a wide variety of solvents
Sample degradation at high test temps	No risk of degradation

miniPV, the Solution to Your Many Challenges

Time consuming manual measurements?

Making the switch to automation saves time and money, frees up operators to accomplish other tasks, and improves accuracy and operator-to-operator variability. The automated sample handling and cleaning features of the miniPV also help minimize operator exposure to chemicals. Equally important to safety and accuracy is rigorous sample analysis. Manual viscometer users have had to shy away from performing more rigorous viscosity analyses such as a Huggins-Kraemer IV analysis due to the time and effort it took. So, most have taken the easier route by using the less rigorous and less accurate Billmeyer IV calculation. Billmeyer IV analysis is sufficient for many and is a very useful technique, however, the Huggins-Kraemer approach gives much more information about the material being analyzed (see Figure 1) to design better/more relevant materials, optimize processing parameters, and better understand how a formulation might behave in its final product form.

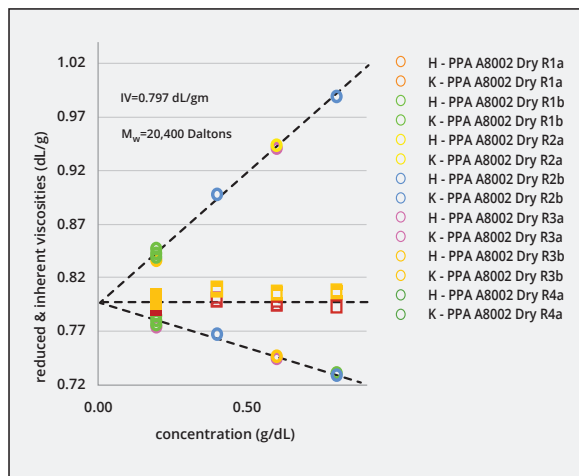


Figure 1

Having to perform cumbersome correlations to IV?

Polymer molecular size affects many processing parameters and end-use performance. Instruments that melt polymers can provide some processing information, but can't assess isolated molecular size information. In the melt state, the concentrated polymer "solution" is so entangled that it becomes impossible to consider an isolated molecule in order to determine its size, which is key to designing desired functional formulations. Therefore, the most accurate and direct way to determine molecular size and its impact on processing and end-use performance is through Intrinsic Viscosity (IV) using the miniPV dilute solution viscometer. Other instruments require development of complicated correlation models that could vary drastically from material to material, supplier to supplier, and lot to lot. Since IV is the gold standard to assess final polymer behavior, knowing the IV of each material is critical in developing targeted functional formulations. The miniPV gives you the IV directly with the highest accuracy available in the market and the capability to handle most types of materials.

Looking for accurate MW determinations?

The miniPV provides accurate MW determinations without the need for baselines subjectivity or fine filtration. By eliminating these main sources of error found in other instruments, the miniPV can yield significantly more accurate MW determinations results. In addition to greater accuracy, measurements on a miniPV are about 50% quicker and switching between materials and solvents can be accomplished in as little as 2 hours compared to, for example, SEC, where the process can be an all-day affair. For those who watch the bottom line, the miniPV delivers significant upfront investment and operating cost savings compared to SEC, where changing out columns can cost tens of thousands of dollars a year. And because it was designed to be a more user-friendly model, the miniPV can easily be operated by any technician with some training, eliminating the need to expend highly qualified resources to operate equipment, as is the case with SEC.

Volatile/hygroscopic components in samples causing erroneous results?

The miniPV offers sealed sample vials and sealed measurements so volatile/hygroscopic materials can be measured without concern. The sealed design also greatly minimizes personnel exposure to volatiles.

Contact Us to Learn More

Data accuracy constrained by fillers and/or post-consumer recycled contaminants? Cannot use your current instrument due to fillers?

With the miniPV, viscosity data accuracy—and as a result MW determination—is virtually unaffected by contaminants and fillers.

Moisture content affecting measurements?

Moisture content in polymers can cause highly erroneous viscosity measurements. Some instruments that measure the melt viscosity at elevated temperatures are prone to highly erroneous results due to trapped bubbles in the samples. Other instruments that require the polymer to be dried for hours at elevated temperatures prior to measurements present additional problems, such as sample degradation. The miniPV eliminates all such pain points as the viscosity data is virtually unaffected by the presence of moisture in the sample and the measurements can be conducted conveniently at close-to-room temperature.

Chemical compatibility limiting analyses?

The miniPV is compatible with a wide variety of solvents, including aggressive aqueous, aqueous, halogenated, and organic solvents, acids, corrosives, salt solutions, and many others. The instrument is capable of analyzing a wide variety of materials and associated solvents including PET, Nylon, PEEK, cellulose, PVC, among others.

Useful Accessories for Putting Polymers in Solution



The Solution Preparation System (SPS) is an invaluable tool to achieve accurate and repeatable viscosity measurements and MW determinations. The SPS automatically titrates the exact amount of solvent (4 decimal places) leading to very accurate solution concentrations eliminating operator error. Also, since the entire titration process is automated, operator exposure to chemicals is drastically minimized.



The programmable heating/stirring block is an invaluable tool in the sample preparation toolkit for viscosity measurements. Samples such as PET, among others, require stirring at elevated temperatures to enable dissolution, and this 8-well, programmable heating/stirring block with accurate temperature control (± 0.1 °C) enables such dissolution, helping prepare homogenous solutions.

Choose the miniPV features and benefits for your needs

	miniPV/miniPV-X	miniPV-H/miniPV-HX
Applications for Polymer Solution Viscosity Related to Molecular Size	biopolymers, cellulose, elastomers, halogenated polymers, polyacetates, polyacrylates, polycarbonates, polyols, polysiloxanes, polystyrene, prepolymer resins, thermoplastic elastomers, thermoset resins, vinyl polymers	
Applications for Shear Viscosity for Flow Properties of Fluids	alcohols, biomedical fluids, cannabis oils, dispersions, epoxy components, glycols, inks, liquid products and intermediates, oligomers, photoresists, silicones	
Additional Applications	n/a	acidic fluids, acidic solutions, PEEK, polyamides, polyaramides, polyesters
Compatible Solvents	organic/aqueous/halogenated salt solutions/caustics/aggressive aqueous(optional)	organic/aqueous/halogenated salt solutions/aggressive aqueous corrosive/acids
Minimum Sample Volume	8 mL	10 mL
Low Volume Option	1.6 mL	n/a
Automation	automatic sample loading, measurement, and wash	
Sample Handler Positions	1 (miniPV) 10 (miniPV-X)	1 (miniPV-H) 10 (miniPV-HX)
Cycle Time: as low as 12 min	✓ yes	✓ yes
Sealed Vial/Open Vials (Note: With low volume option, only Open Vial is available.)	✓ yes	✓ yes
Dispersions	✓ yes	✓ yes
Temp Range: 15 °C–100 °C	✓ yes	✓ yes
Temp Accuracy: 0.01 °C	✓ yes	✓ yes
Viscosity Range: 0.02-1,200 cSt	✓ yes	✓ yes
Viscosity Accuracy: 0.36%	✓ yes	✓ yes
Viscosity Precision: 0.2% Relative Standard Deviation (RSD) using standard oils	✓ yes	✓ yes
21 CFR 11 Compatible	✓ yes	✓ yes
Reported Values	dynamic viscosity (with optional density meter), inherent viscosity, intrinsic viscosity, kinematic viscosity, molecular weight, reduced viscosity, relative viscosity, specific viscosity	
Method Compliance	ASTM D445, ASTM D1243, ASTM D1795, ASTM D2857, ASTM D3591, ASTM D4243, ASTM D5226, ISO 1628-1, ISO 1628-2, ISO 1628-4, ISO 1628-6, ISO 3104, ISO 5351, DIN 51562-1, IEC 60450, Ph. Eur. 1472, Tappi T230, USP 911	
Additional Method Compliance	n/a	Nylon: ASTM D789, ASTM D5336, ISO 307 PET: ASTM D4603, ISO 1628-5



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