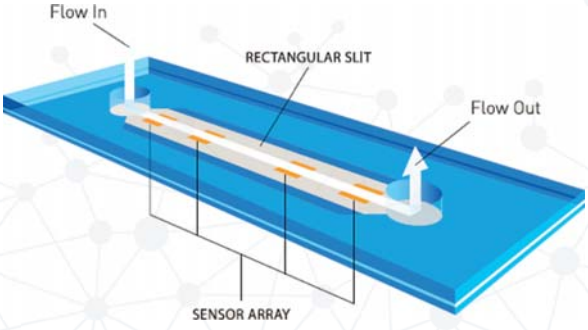
RheoSense
Simply Precise®

VROC® initium

The First Automatic Viscometer/Rheometer for Viscosity Fingerprinting



VROC® Technology

Viscometer-Rheometer-On-a-Chip

A combination of microfluidics and MEMS, VROC® technology offers a number of advantages:

- Small sample volume
- Closed environment prevents evaporation,contamination, and interfacial artifacts
- Direct measurement of viscosity - First principle
- Characterization of both Newtonian & non-Newtonian fluids

www.rheosense.com/technology

- Small sample volume, minimum 26µL with sample recovery
- Broad viscosity ranges
- Rapid temperature control from 4 - 70 °C
- 96 well plate or 40 vial rack
- Automatic measurements with shear & temperature rate sweeps
- One minute hands on time

VISCOSITY

FINGERPRINT

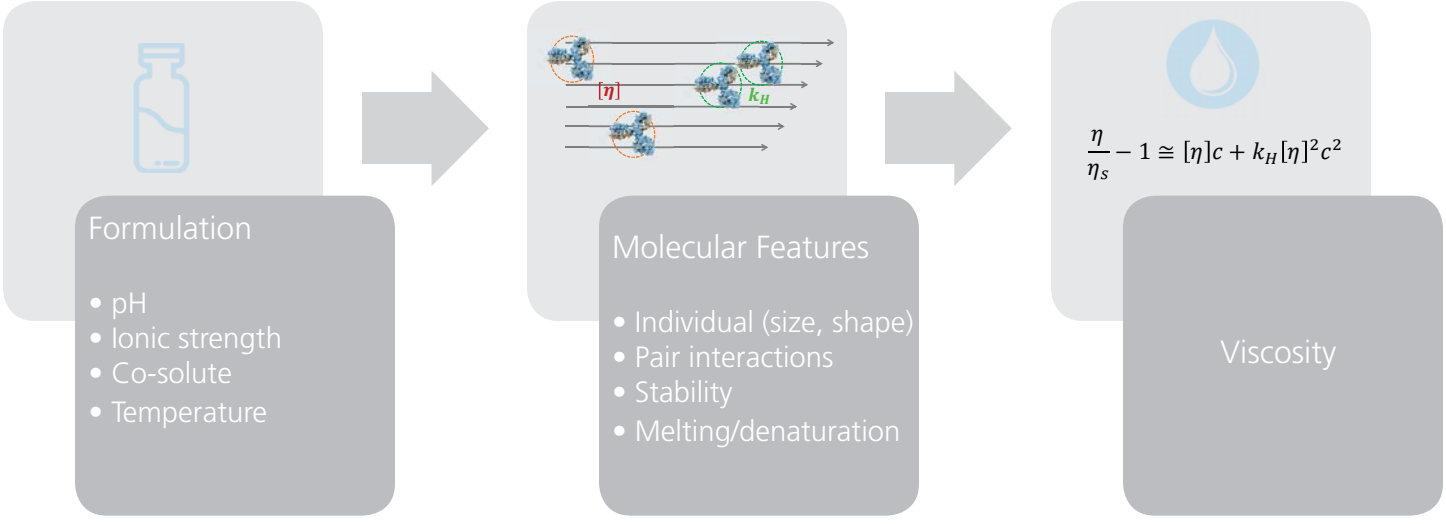
Viscosity Fingerprinting

Just like a fingerprint, each one of your samples is unique and requires accurate viscosity characterization.

With VROC® initium, a vareity of tests are at your fingertips:

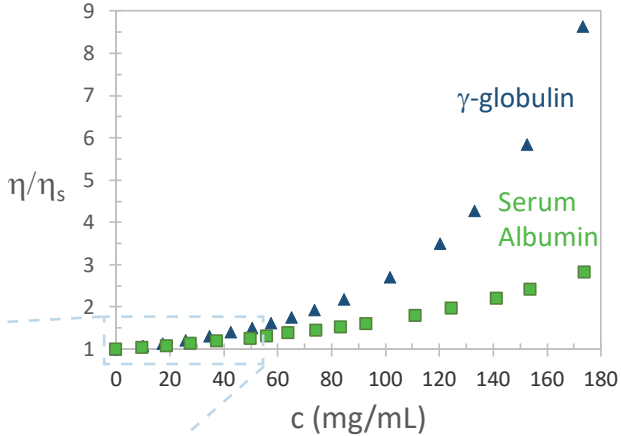
- Concentration Effect
- pH Effect
- Buffer Type
- Excipient Type
- Temperature
- Denaturants
- Solubility
- High Throughput Screening
- Viscosity Injectability of Protein Therapeutics
- Stability of Protein Therapeutics
- Enzymatic Reaction of Carbohydrates

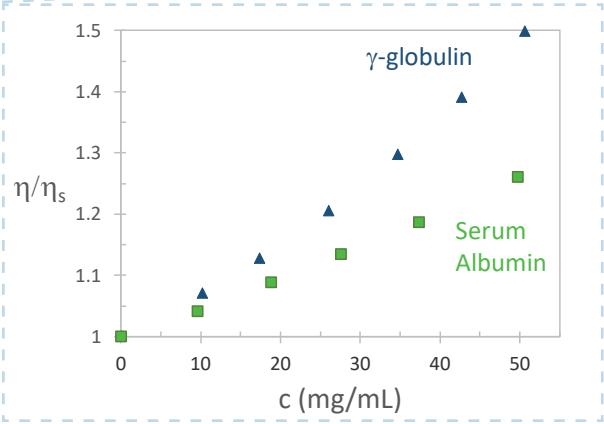
Intelligent Formulation - Work Smart, Not Hard



Distinguish Samples - Concentrated to Dilute

Obtain complete viscosity profiles of protein formulations up to therapeutic levels



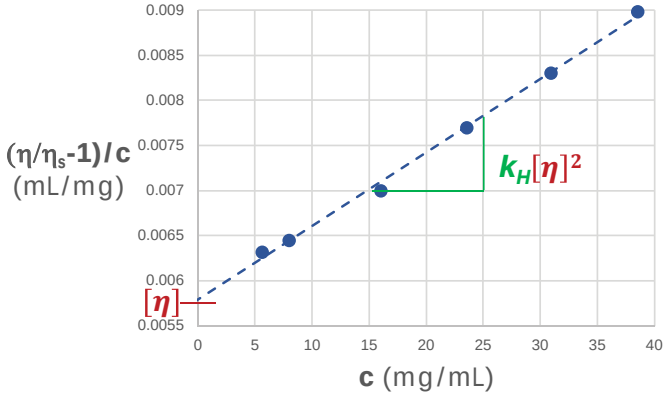


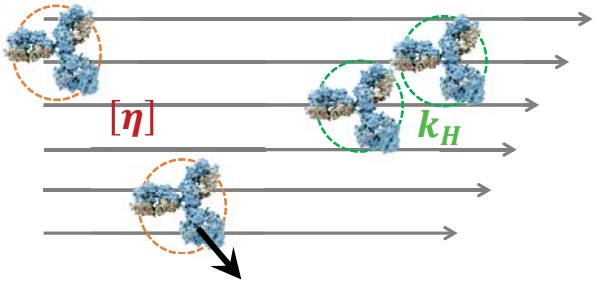
Or focus on distinguishing samples in the dilute regime to preserve sample and perform more detailed molecular characterization

Intrinsic Viscosity Measurement - Detailed Molecular Analysis with Dilute Solutions

Analyze concentration series data with the Huggins equation

$$\frac{\eta/\eta_s - 1}{c} = [\eta] + k_H[\eta]^2 c$$





$$r_h = \left(\frac{3[\eta]M_w}{10\pi N_A}\right)^{1/3}$$

Quantify individual molecule features or pair interactions

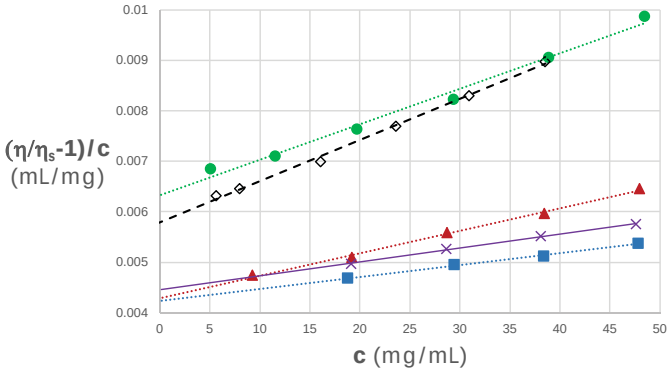
Intrinsic viscosity $[\eta]$

- characteristics of individual molecules
- use to calculated hydrody namic radius (r_η)

Huggins coefficient k_H

- reflects magnitude of pair or protein-protein interactions **(PPI)**

Intrinsic Viscosity Measurement - Quantify Differences in Protein Formulations

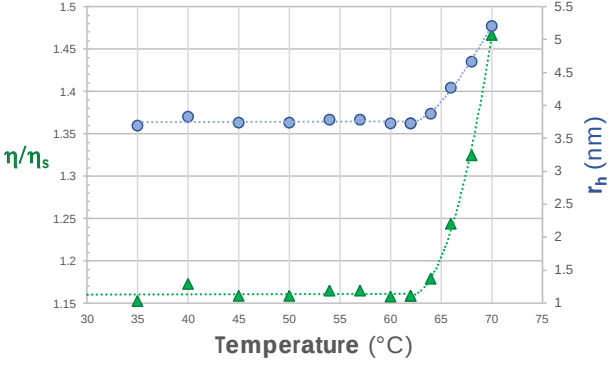


Protein	Formulation	[η] (mL/g)	r_h (nm)	k_H
γ-globulin	PBS	6.3	5.4	1.76
γ-globulin	PBS + 4% sucrose	5.8	5.3	2.43
Serum Albumin	pH 5.4, IS 20mM	4.5	3.6	1.39
Serum Albumin	pH 8.4, IS 29mM	4.3	3.6	2.42
Serum Albumin	pH 8.4, IS 160mM	4.2	3.5	1.32

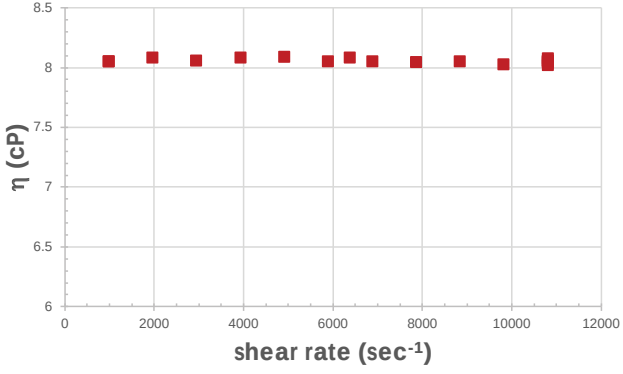
Extracted values for **[η]**, $\mathbf{k_H}$, and $\mathbf{r_h}$ quantify the impact of formulation variations

- Protein type and molecular weight
- Addition of sugar stabilizers or co-solutes
- pH
- Ionic strength

Explore Temperature and Shear Rate Dependence



Monitor stability of proteins to determine denaturation or melting temperature by tracking relative viscosity (η/η_s) and hydrodynamic radius (r_h).

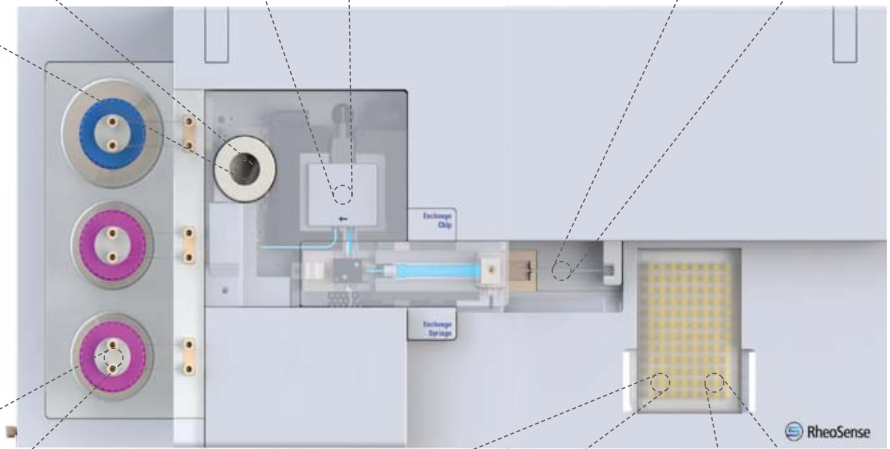


Or determine the impact of shear strength on the sample's microstructure with a shear rate sweep.

Reservoir for retrieving samples maximizes output with minimum volume

Proprietary VROC® chip senses accurate viscosity for viscosity fingerprinting

High precision DC servo pump for precise shear rates



System intelligence senses and warns about low levels in solvent bottles

Autosampler injects samples from 96 well plates or 40 vials in a rack

Sample vial temperature control 4- 40 ° C

Specifications:

Power: AC 110 ~ 220 V, 50/60 Hz

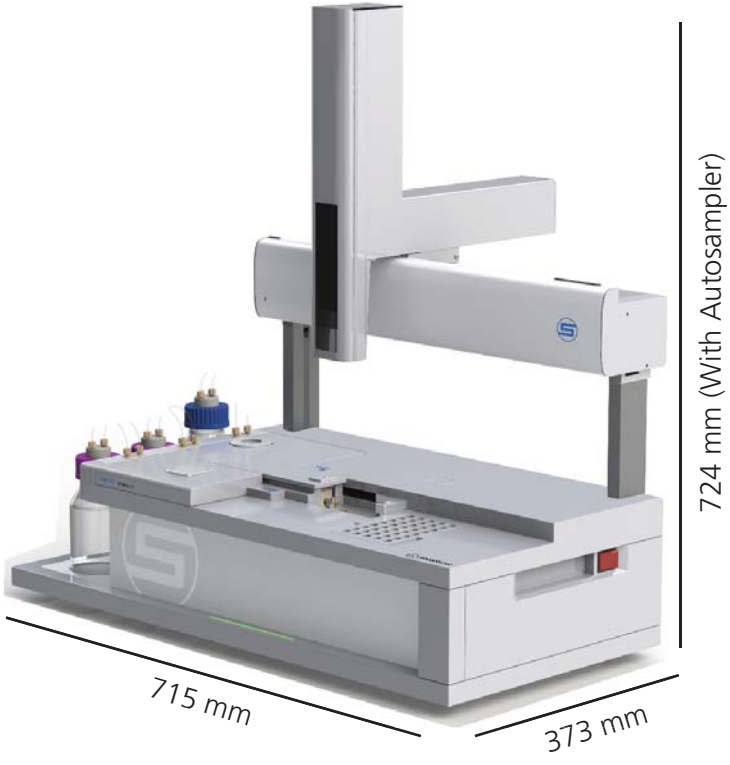
Width: 715mm

Length: 373mm

Height: 193 mm (without autosampler)
724 mm (with autosampler)

Weight: 25 kg

CE and UL Certified



MEMO

Sample Type: Number of Samples:

Estimated Viscosity & Particle Sizes:

Desired Temperatures and Shear Rate:

Contact Information:

MEMO

RheoSense

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RheoSense is a global high-tech company based in Bay Area, California. Our innovative m-VROC® & microVISC™ viscometers feature patented Viscometer/Rheometer-on-a-Chip (VROC®) technology. Utilizing state-of-the-art MEMS and microfuidic breakthroughs that redefined the viscometry industry, our instruments offer the smallest sample volume per measurement coupled with exceptional ease-of-use and accuracy.

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