e-VROC

Extensional Viscosity Measurement

When you need to understand extensional and shear viscosities in your complex industrial process, e-VROC is the ideal solution for precise, reliable measurement.

e-VROC™ provides extensional viscosity data by monitoring the sample flow through a microfluidic contraction within the measuring cell. The system measures the pressure upstream and downstream of a contraction using the MEMS pressure sensors, and it registers changes in the flow. The fluid undergoes an almost constant extension through the contraction/expansion, enabling the calculation of the extensional viscosity.

The advantage of this approach is that shear-rate dependent viscosity and extensional viscosity can be provided at a specific temperature within the same measurement.

e-VROC™ is ideal for polymer applications, or for fluids with certain extensional viscosity properties similar to those that are used as additives to prevent mists from forming in volatile fluids like jet fuel or for turbulent drag reduction in oil pipelines and sewer systems.

Technical Specifications

Minimum Sample	500 µL
Viscosity Range	10.0-2,000mPas
Shear Rate Range	0.1-1000 s^{-1}
Temperature Range	4-70°C
Temperature Stability	~+/-0.07°C
Extensional Viscosity	Yes
Accuracy	~+/- 2% reading
Repeatability	~+/- 0.5% reading
Shear Sweeps	Yes
Temperature Sweeps	Yes
Typical Test Time	<1min

Other Applications Include:

- Fiber extrusion spinnerets
- Paint rolling
- Blow molding
- Ink jet printer nozzles
- Sheet or film drawing
- Flow through a porous media

RheoSense, Inc.
2420 Camino Ramon, Suite 240
San Ramon, CA 94583
Phone: 925-866-3808
Fax: 925-866-3804

www.RheoSense.com
info@rheosense.com

RheoSense
Simply Precise™

RheoSense *e*-VROC™ Technology

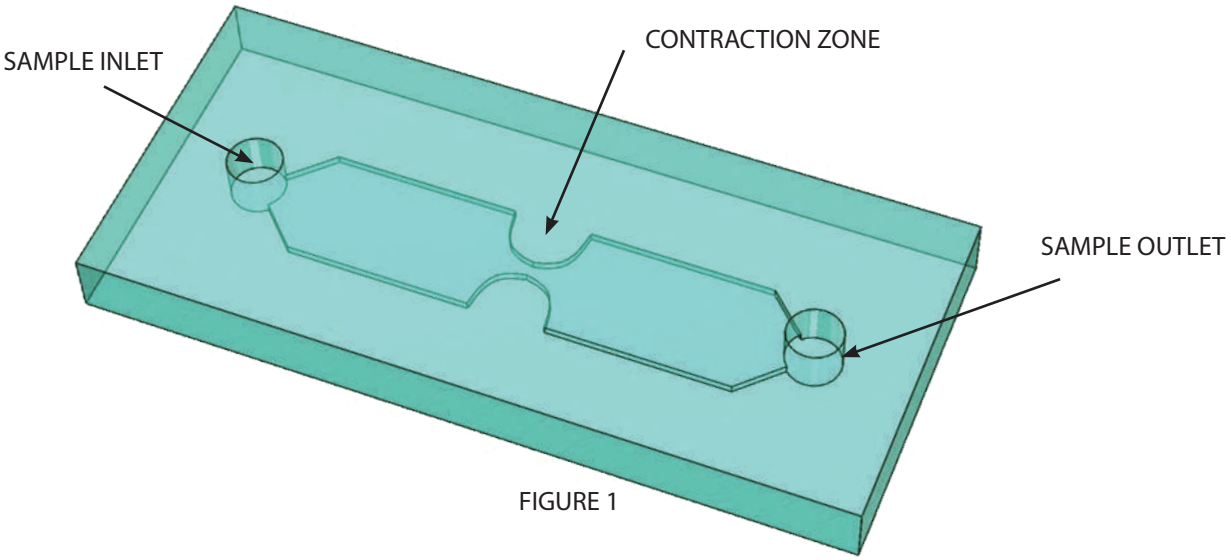


FIGURE 1

Technology

The breakthrough *e*-VROC™ (Viscometer/Rheometer-On-a-Chip) technology offers powerful advantages over conventional viscometers and rheometers.

The *e*-VROC™ solution:

- Requires as little as 500µL of sample
- Offers a remarkably wide dynamic viscosity range
- Achieves exceptionally high and low shear rates
- Automated testing for rapid results
- Prevents film forming, evaporation, and
- contamination
- Measures both Newtonian and non-Newtonian fluids easily
- Has a very small footprint
- Delivers extraordinary precision and accuracy

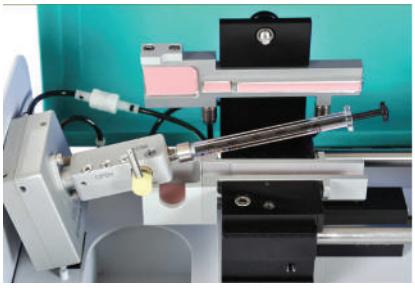
With *e*-VROC™, RheoSense took the standard principles of rheometry and created a dynamic micro-sample viscometer by adding microfluidics while reducing the size of the device with MEMS (micro-electrical mechanical systems) manufacturing. The result was a new technology that allows the measurement of extensional viscosity at high extensional rates, compared to other methods.

Scientific Principle

The e-VROC™ chip is engineered with a microfluid channel of uniform width and depth. It has hyperbolic contraction/expansion zone in the middle of the channel and four monolithically integrated MEMS pressure sensors (two in the upstream and two in the downstream of the contraction/expansion zone). A liquid entering the channel first experiences shear flow in the straight channel and then experiences a uniform extension in the contraction zone as illustrated by the elongational shape change of the square in figure 1.

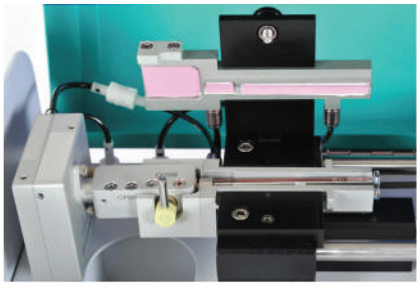
Compared to other methods of extensional viscosity measurement, e-VROC™ allows the measurement of extensional viscosity at high extensional rates. The system measures the pressure upstream and downstream of a contraction using the MEMS pressure sensors, and it registers changes in the flow. The fluid undergoes an almost constant extension through the contraction/expansion, enabling the calculation of the extensional viscosity.

Step 1



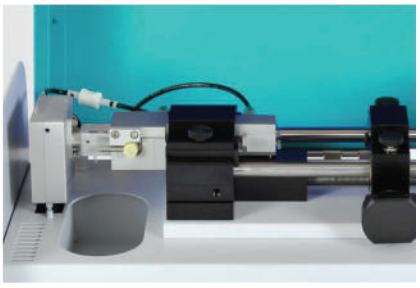
Load the syringe with sample.

Step 2



Thread the syringe into the measuring cell and close the thermal jacket

Step 3



Press start and begin the measurement