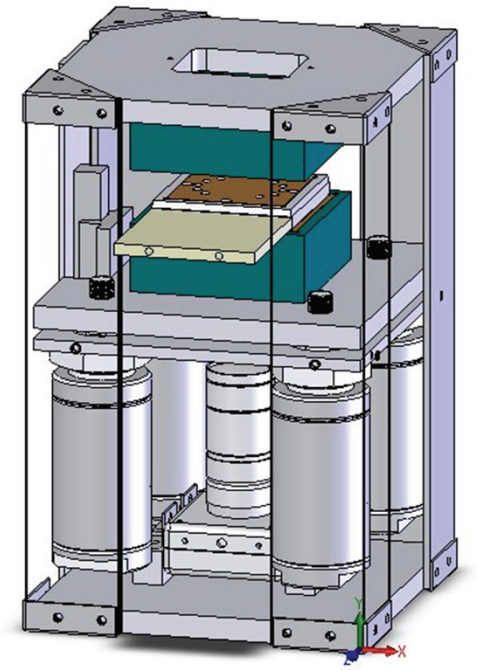
Parallel microsample melt rheology

Summary

Conventional methods of determining the flow of polymer melts are expensive and time consuming, and require skilled operators and large sample volumes. In addition, quality control frequently requires multiple specimens for accuracy. CPG has developed a multi-specimen, low-volume, high-throughput melt rheometer for QC and development that will find use with high-value materials or in environments where parallel sampling is desirable.

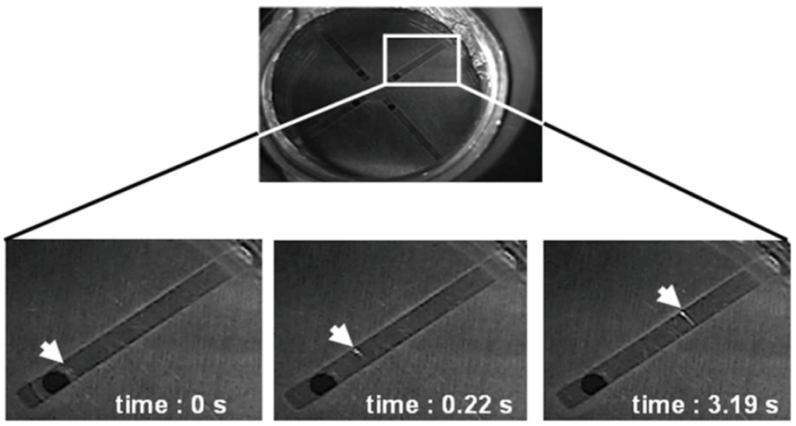


Description

In 2010 NIST published the development of a simpler, pressure drive rheometer that utilize a slit geometry to determine the rheology of a polymer melt. This original concept was extend by CPG with SBIR grant 9.02.04-5.TT to allow enhanced functionality, greater flexibility and improved throughput. A digital camera system is used to monitor the free-surface flow front of a polymer melt as it is driven through a standard slit geometry. This system is theoretically robust and allows multiple samples to be run at high temperatures in a design that can be easily assembled and disassembled. The device should find usage in quality control environments or in high-added-value markets such as combinatorial chemistry and speciality materials.

Specifications

Parameter	Value
Slit height x width	0.132 x 1.3 mm
Slit Length	13 mm
Shear rate	0.001-10,000 1/s
Temperature	-40 – 450 °C
Drive pressure	~0 – 12.4 MPa
Resolution	0.022 mm (0.17% strain)
Sample volume	2.2 μL
Sample count	5-10



Images: Moon et al. JoR 2008

Markets

- Combinatorial polymer development
- Protein solutions in pharmaceutical development
- Quality control environments

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