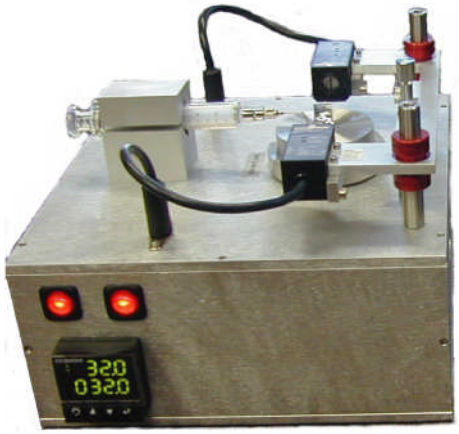
The SRT™ Swell Ratio Tester

Measuring the swelling behavior of crosslinked polymers



Swelling of Polymer Networks

When a polymer sample is placed in a good solvent, the solvent interpenetrates the polymer chains, forcing them apart and eventually causing the polymer to dissolve. If the polymer sample is crosslinked, either through chemical crosslinks or physical structures such as crystalline regions, the chains will be pinned at the crosslinks, preventing complete dissolution. The net effect of this pinning is that the polymer sample swells instead of dissolving.

The change in size of the sample as it swells is a function of the polymer-solvent interaction and the number of crosslinking points. Measurements of the degree of swelling of polymer systems can be used to calculate the theoretical crosslink density, molecular weight between crosslinks, and number of repeat units per crosslink.

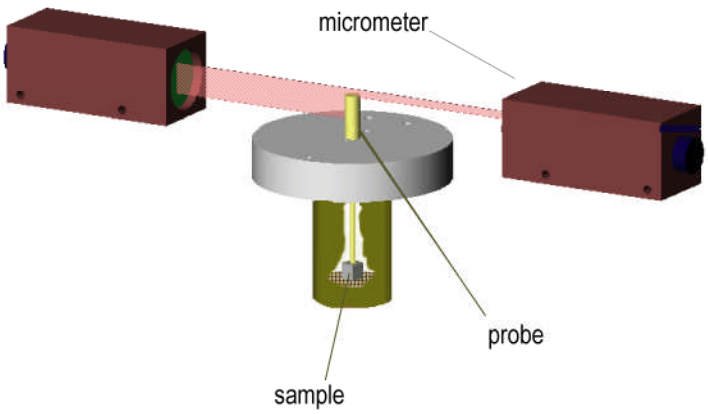
The SRT™ Swell Ratio Tester

The SRT™ was developed to monitor the transient swelling behavior of polymer samples. The swelling kinetics and steady state swell ratio can be easily observed. All measurements are made with the sample immersed in the solvent, so that errors and hazards associated with solvent evaporation are avoided.

For application notes on using the SRT™,
please visit http://www.campoly.com/application_notes.html

Principles of Operation

A polymer sample is placed in a temperature-controlled chamber. A lightweight probe sits on top of the sample, and partially blocks the beam of a laser micrometer. Solvent is introduced into the chamber, and the chamber is raised to the desired temperature. As the sample swells, the micrometer monitors the position of the probe.



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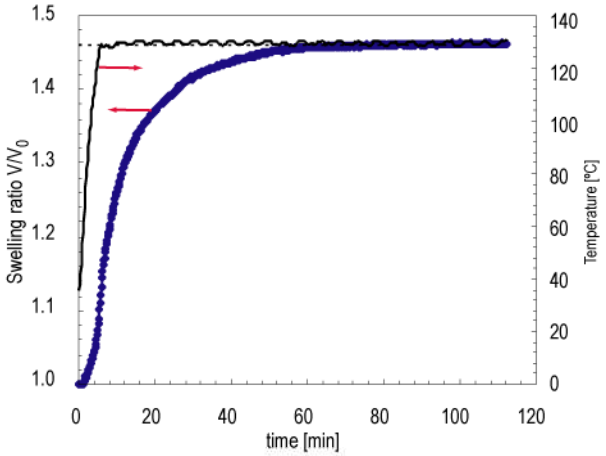
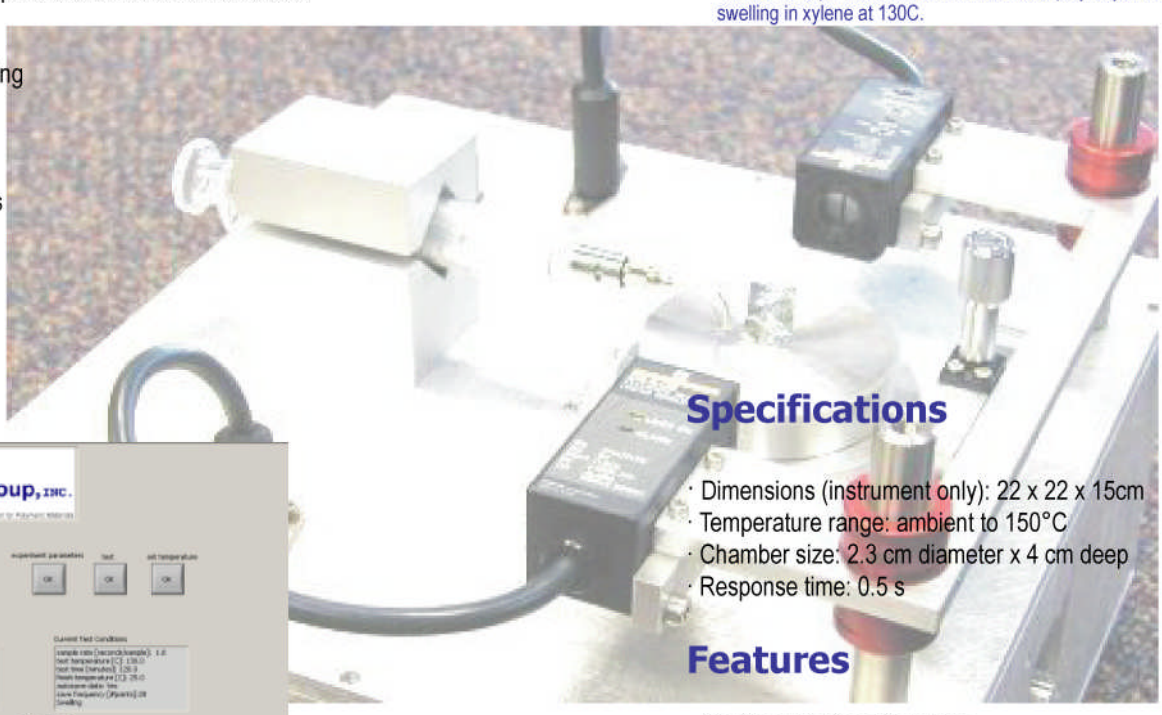
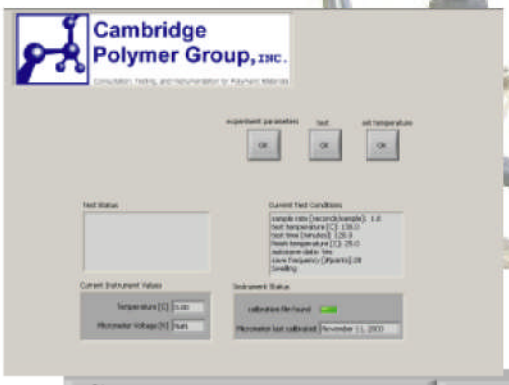
Applications

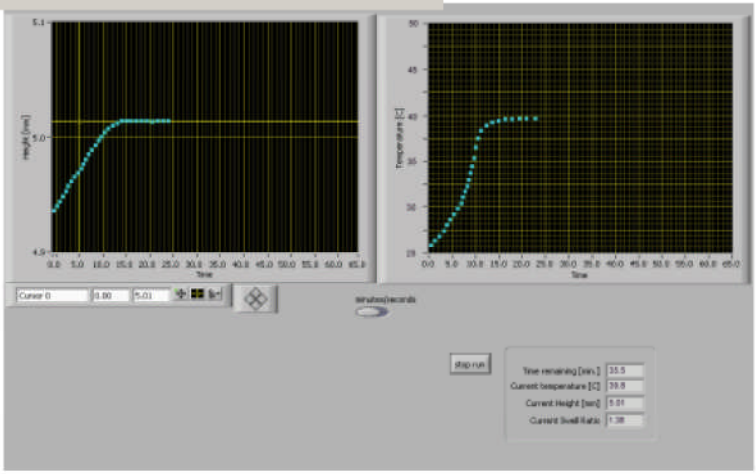
- Crosslinked resins
  - crosslink density as a function of dose
  - variation in received dose in sample thickness
  - effects of filler content
  - quality control test
- Polymer gels
  - swelling kinetics as a function of sample size
  - time to steady state
  - effects of temperature and solution conditions
- Granular materials
- Cable and wire coating
- Gasketing materials
- Thermosets
- Biomedical materials



Transient response of radiation-crosslinked polyethylene swelling in xylene at 130C.







Specifications

- Dimensions (instrument only): 22 x 22 x 15cm
- Temperature range: ambient to 150°C
- Chamber size: 2.3 cm diameter x 4 cm deep
- Response time: 0.5 s

Features

- Provides kinetics of swelling
- Eliminates handling samples saturated with solvent
- Compute Flory network parameters
- Data streaming to disk prevents data loss for long test
- Swelling as a function of temperature
- Quantify anisotropy
- Compliant with ASTM F2214-02

Software

- Windows XP/2000//XPNT compatible software (vs. 3.0)
- Data export to ASCII format
- Range of test conditions

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