

Rheological Characterization of soft materials using the multifunctional rheometer

The rheological character specified by a stress-strain relationship, can be conveniently determined with a rheometer. Using the multifunctional rheometer, the gelation process of a rapid curable epoxy resin, the extensional viscosity of molten polymers, etc. are investigated.

Multifunctional rheometer



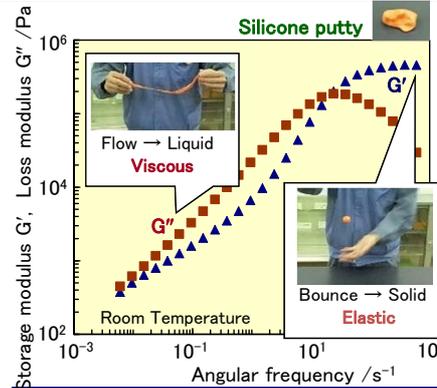
Specifications

Angular frequency range	$1.0 \times 10^{-7} \sim 6.3 \times 10^2 \text{ s}^{-1}$
Rotation speed	$1 \times 10^{-5} \sim 2.9 \times 10^3 \text{ rpm}$
Torque range	$5 \times 10^{-8} \sim 2 \times 10^{-1} \text{ Nm}$
Temperature range	$-150 \sim 600 \text{ }^\circ\text{C}$
Maximum heating rate	$20 \text{ }^\circ\text{C/min}$ (controlled)

Additional function

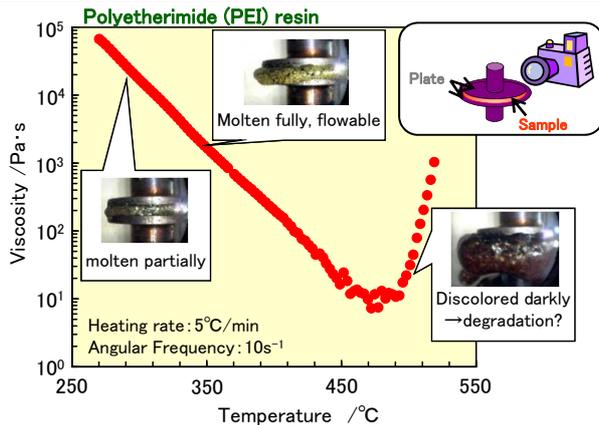
- snapshot recording
- fast sampling
- measurement of uniaxial extensional viscosity
- stress relaxation under large deformation
- measurement of normal stress, and more...

Visco-elastic properties exhibiting on soft materials



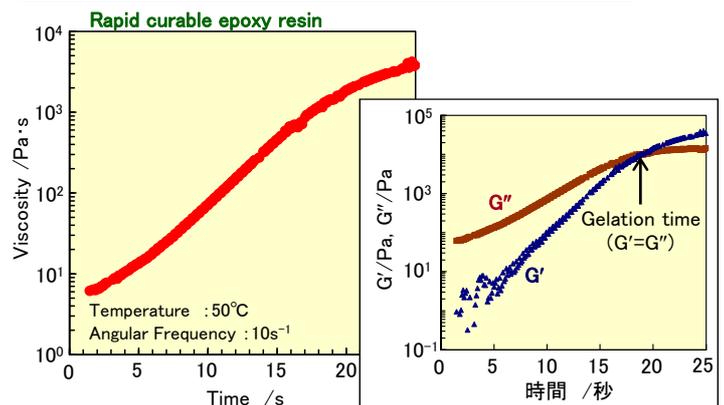
From the frequency sweep measurements, different properties of soft materials can be investigated.

Measurement of melt viscosity and simultaneous monitoring [snapshot recording]



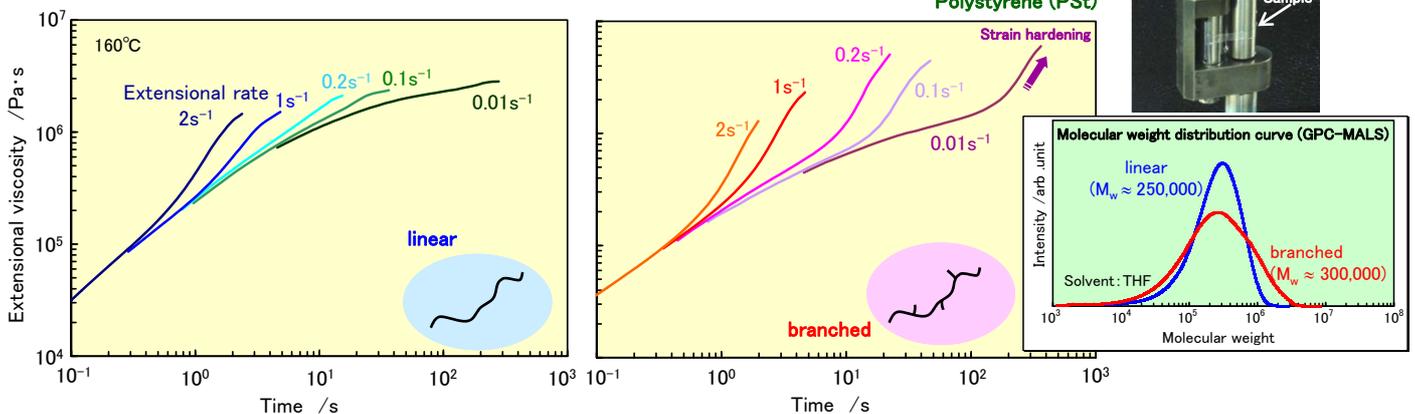
The temperature dependence of melt viscosity under higher temperature of engineering plastic materials, which is molten and formed, can be obtained. Combination with "snapshot recording" may be conducive to an elaborate discussion about the viscosity change.

Clarification of the reaction process in a short period [Fast sampling]



"Fast sampling" allows us to acquire the data every 100ms. Change of moduli as well as viscosity in a short period can be observed, and the gelation time, where network formation starts, can be estimated precisely.

Uniaxial extensional viscosity of molten polymers



Extensional viscosity, as an important parameter for spinning, film orientation, blow molding, etc., can be obtained by winding up the sample at constant rate using the dedicated test fixture. Strain hardening (exponential increase on extensional viscosity) at lower extensional rate is observed for the PSt containing a small amount of high molecular weight component and/or the branch, and having molecular weight which is almost equal to the linear PSt.