INSTRON 4443 tensile testing

Bench-top testing unit:

Elastomers are chemically crosslinked or vulcanized chains which become permanently elastic compared to their un-crosslinked analogue which shows time-dependent relaxations in various regimes. The latter are to be studied in a dynamic rheological experiment. Due to the crosslinking a state in between solid state and liquid-like state is obtained. The high strains that these elastomers can cope with, are due to their complex connectivity. The description of their stress-strain behaviour as obtained from a tensile testing experiment is vital for the microscopic understanding of structure-property relationships. They complement real microscopic measurements of the elastomeric network by e.g. scattering methods.

Crosshead speed	**0.1mm/min - 1000mm/min**
Data acquisition rate	**500Hz**
Gauge length	**900mm**
Maximum strain	**~1000%**
Loadcell tension and pressure	**+/- 100N (resolution 0.5%)**
Self-adjusting elastomer grips	**1kN**

Tensiometer Instron

ARES Rheometric Sci

Strain-controlled dynamic mechanical spectrometer

The visco-elastic or rheological properties of polymers can be easily determined from dynamical-mechanical experiments as a function of time, frequency and temperature. Their understanding is important for the design of new materials as well as the processing conditions of known polymers. The response to linear or non-linear deformation is highly sensitive even to the architecture of the polymer chain. Testing a sample isothermally over a specific frequency range or time domain yields typical storage and loss moduli which can be shifted by the time-temperature-superposition principle to any reference temperature to cover several magnitudes in the (unmeasured) time or frequency range. The full relaxation time spectrum can then be obtained from this as well and quantitative comparisons with theoretical expectations from microscopic approaches can be done. The results complement typical time-dependent scattering methods like neutron spin-echo spectroscopy or quenched small angle neutron scattering.

Angular frequency	**0.001-100 rad/s**
Torque 2kN FRT transducer	**2-2000 g**
Temperature	**-150°C < T <350°C**
Temperature controller	**Liquid N_2 +gas**
Tools	**Parallel plates 25 and 8mm, cone-plate (0.04 rad), torsion, couette**

Rheometer ARES

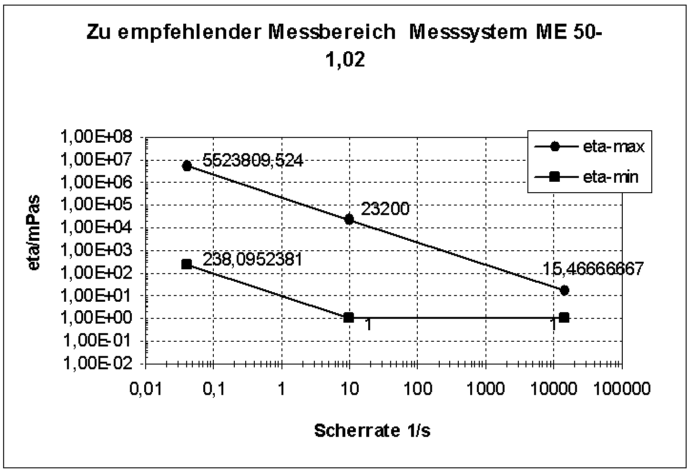
RHEOWIS :

Rheometer with in-situ capability for SANS

Complementary to the ARES rheometer, emphasis on solution viscosities can be obtained from steady-state measurements. Although RHEOWIS is able to investigate also ‘elastic liquids’ its use is mainly foreseen for ‘viscous’ liquids. The measured viscosity is a function of the applied shear rate which itself is determining the characteristic times of processes which can be investigated. They are related inversely. To avoid perturbance of the laminar flow between 2 walls a Couette geometry is chosen. The rheometer is modified and reconstructed to allow in-situ small angle neutron scattering experiments.

Frequency	**0.005 – 10 s^{-1}**
Rotation speed	**0.007 – 2000 rpm**
Torque	**10^{-7} - 0.046 Nm**
Temperature range	**-20°C - +140°C**

In-situ Couette shear rheology-SANS



Recommended range of operation for Couette rheometer