Materials Testing

FAUSKE & ASSOCIATES, LLC
World Leader in Nuclear and Chemical Process Safety

Dynamic Mechanical Analysis (DMA)

Dynamic Mechanical Analysis is a state-of-the-art technique for understanding how the mechanical properties of a material behave as a function of time, temperature and frequency. Fauske & Associates, LLC (FAI) uses this effective method for characterizing the viscoelastic behavior of plastics, rubbers, and other polymeric materials.

What can be characterized by DMA:

- Viscoelastic Behavior
- Damping Behavior
- Creep and Stress Relaxation
- Glass and Secondary Transitions
- Curing Behavior

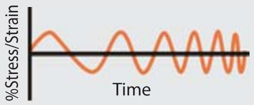
FAI utilizes the Q800 DMA manufactured by TA Instruments

Available Modes of Deformation:

- 3-point Bending
- Single/Dual Cantilever
- Compression
- Tension
- Shear

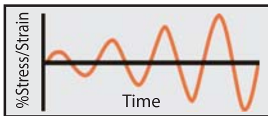
Typical Test Modes:

- Multi-Frequency



The multi-frequency mode can assess viscoelastic properties as a function of frequency, while oscillation amplitude is held constant. These tests can be run at single or multiple frequencies, in time sweep, temperate ramp, or temperature step/hold experiments.

- Multi-Stress/Strain

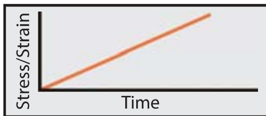


In this mode, frequency and temperature are held constant, and the viscoelastic properties are monitored as % strain or the stress is varied. This mode is primarily used to identify the Linear Viscoelastic Range (LVR)

- Creep/Stress Relaxation

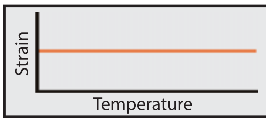
With creep, the stress is held constant and deformation is monitored as a function of time. In stress relaxation, the strain is held constant and the stress is monitored vs. time.

- Controlled Force/Strain Rate



In this mode, the temperature is held constant while stress or strain is ramped at a constant rate. This mode is used to generate stress/strain plots to obtain Young's Modulus. Alternatively, stress can be held constant with a temperature ramp while strain is monitored.

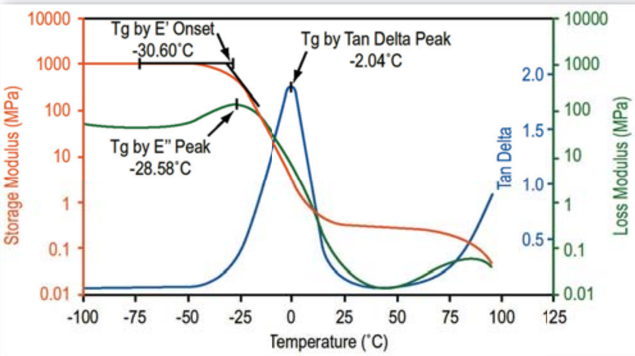
- Isotrain



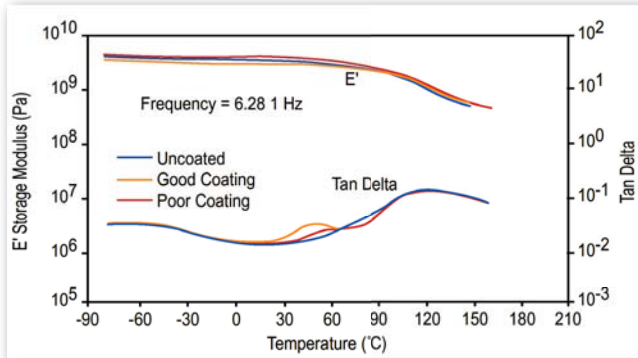
With this mode, strain is held constant during a temperature ramp. Isostrain can be used to assess shrinkage force in films and fibers.

Typical Applications:

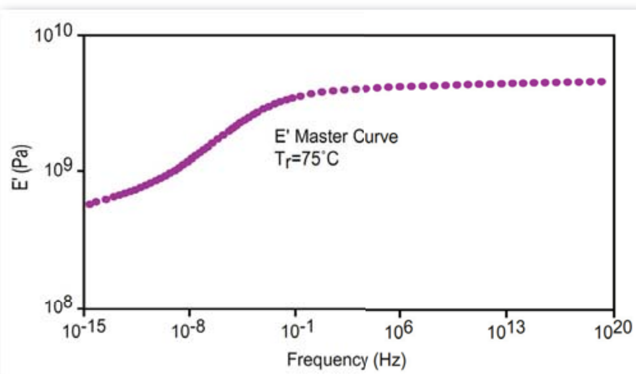
- The glass transition of a material can be strongly influenced by the frequency of deformation. Thus, DMA can be used to characterize the frequency effects of a materials modulus and glass transition.
- DMA can be used to study the effects that plasticizers, fillers, modifiers, and colorants have on material properties.
- The performance of a material over a long duration or over a frequency range outside the parameters of the test equipment can be estimated using Time-Temperature Superposition (TTS).
- DMA can be used to characterize the creep and recovery behavior of films, solders, and other materials, as well as characterize the cure profile of epoxies and other compounds.



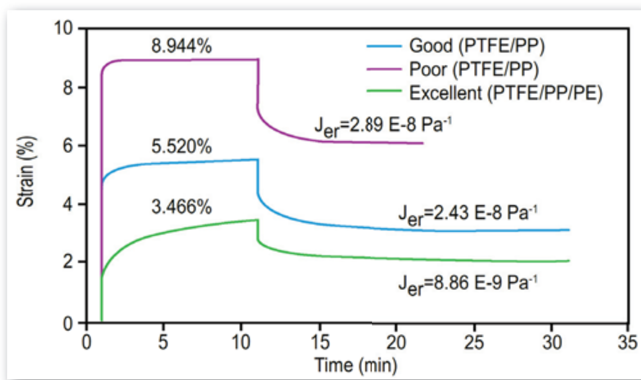
Measurement of Tg of Polymeric Materials



Measuring Effect of Adhesive Coatings on Films



Predicting Material Performance Using TTS



Measuring Packaging Films Using Creep

Potential Applications:

- Determining material properties for engineered materials to be used as input in Finite Element Modeling (FEM) or other analyses.
- Characterization and prediction of failure modes for assembled components at service conditions.
- Root cause analysis investigations – the in-service load on a component or material could be simulated to determine the evolution of the material properties before failure occurred.