

Dynamic Mechanical Thermal Analysis

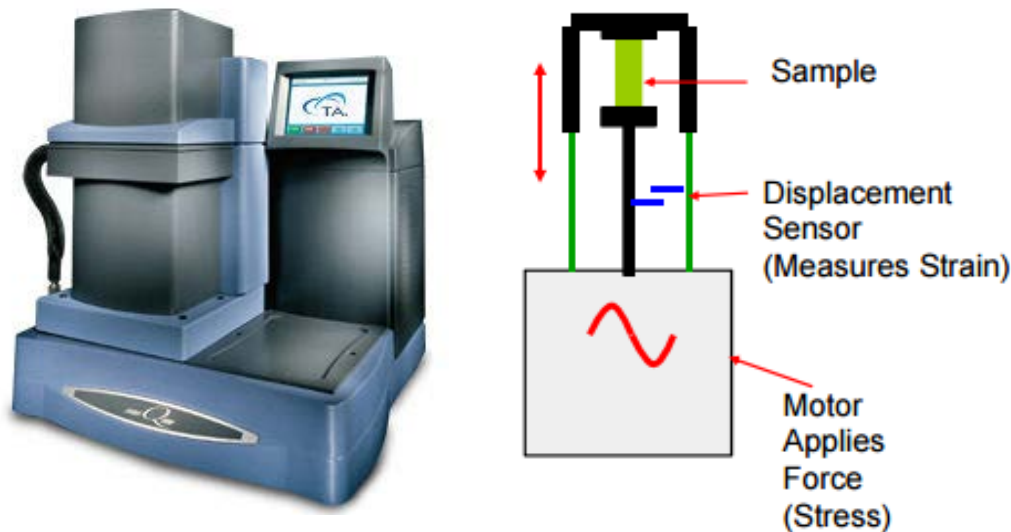
TA instruments, Q800



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Introduction

Dynamic Mechanical Analysis (DMA) is a technique used to measure the mechanical properties of a wide range of materials in the solid state. Many materials, including polymers, behave both like a viscous fluid and an elastic solid that is why they are called viscoelastic materials.



Principle

The Q800 DMA is a stress (force) controlled instrument.

It is composed of the following;

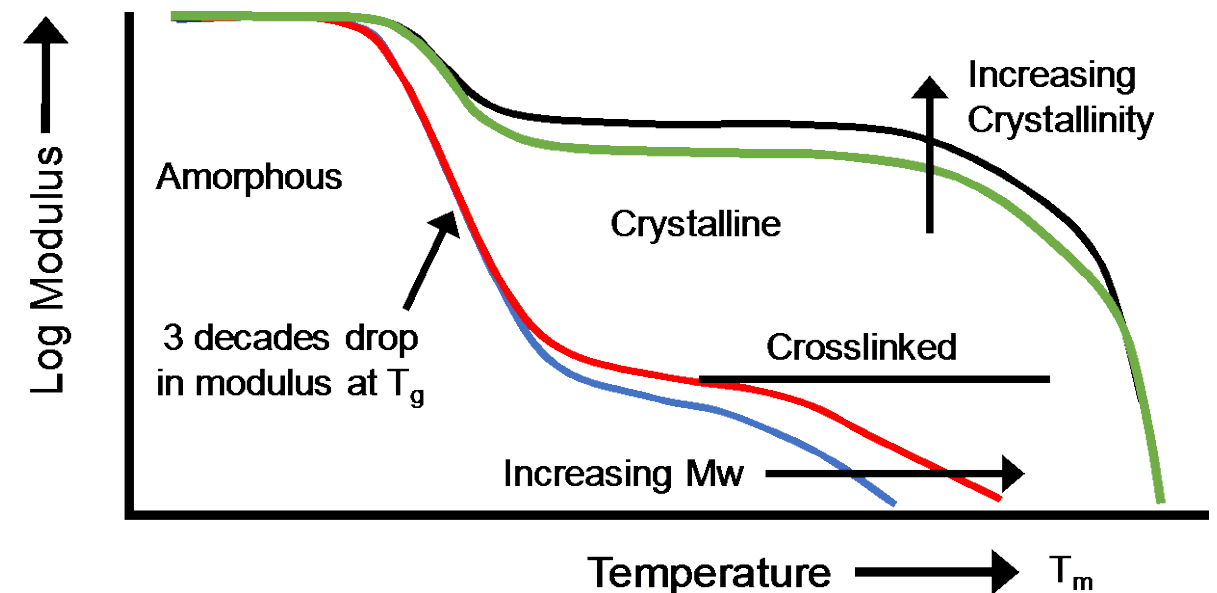
- A motor which applies force (stress to the sample).
- A displacement sensor that measures strain (amplitude).

When programming an experiment the deformation is exerted in the form of amplitude or strain.

The instrument then applies force (the control parameter) until it measures the requested amplitude or strain.

Applications

- Time, temperature & Frequency dependence of Storage & Loss Modulus, $\tan \delta$.
- To Compare materials (Modulus & Transition temperatures).
- Thermoset Curing Behavior (Handling time and process temperature).



Effect of Crystallinity, Molecular Weight and Crosslinking on Modulus

Storage moduli (E')
Loss moduli (E'')

Loss tangent ($\tan \delta$).
Rubbery plateau modulus.