

TA INSTRUMENTS

BREAKING DOWN BIOPOLYMER TESTING

As demand rises for more environmentally friendly polymer alternatives, so does the need for testing those new bio-based plastics. Explore how and why you should test your biopolymer to ensure optimized functionality.



CHALLENGES WHEN DEVELOPING A BIOPOLYMER

CHALLENGE 01

Achieving desired thermal and mechanical properties

- Find the melting point of your material
- Understand your material's viscoelasticity
- Know the yield and ultimate strength of your material through mechanical testing

CHALLENGE 02

Maintaining proper barrier properties

- Know how your material will behave in various environmental conditions
- Understand the permeability or impermeability of your material
- Characterize how your materials withstand the environmental factors like water vapor and UV-light transmission

CHALLENGE 03

Compatibility and processability in manufacturing

- Manufacture a consistent product
- Receive the correct output material
- Engineer the correct blend of materials to consumer requirements

WHY DO YOU NEED TO TEST YOUR BIOPOLYMER?



Develop and deliver consistent products



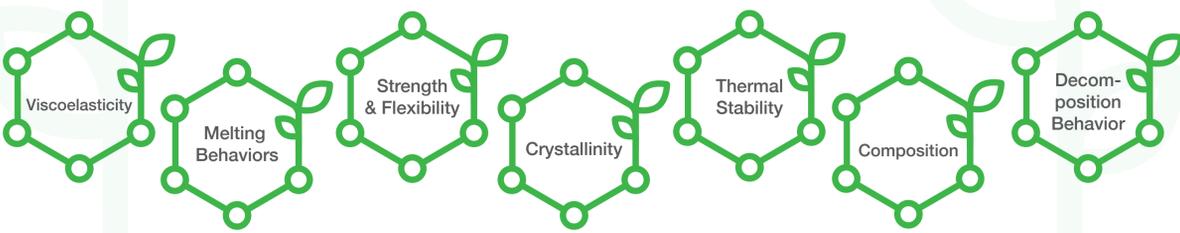
Engineer product quality



Know how your material will behave in all environmental conditions

WHAT CAN I FIND BY TESTING MY BIOPOLYMER?

Find your material's...



WHEN SHOULD YOU TEST YOUR BIOPOLYMER?

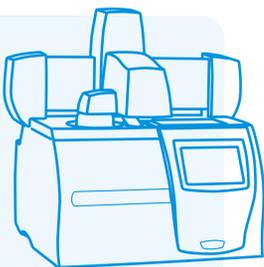
DURING POLYMER DEVELOPMENT

THERMAL STABILITY & MELTING POINT

The thermal stability and melting point of biopolymers are crucial for processing and end-use applications. Some biopolymers may require chemical modification or blending with other materials to improve their thermal properties. Additionally, understanding biodegradation mechanisms can assess how a biopolymer will degrade in the environment.

SOLUTION

You can find the melting point and stability of your biopolymer using a Differential Scanning Calorimeter (DSC).



MELTING BEHAVIORS & VISCOELASTIC PROPERTIES

Biopolymers should be compatible with existing processing equipment and techniques. They should also be easily processable into various forms and shapes, which can be a challenge due to their different melting behaviors and viscoelastic properties.

SOLUTION

With a rheometer, viscosity measurements extend far beyond the limits of a traditional viscometer, characterizing non-Newtonian behaviors like shear thinning, thixotropy, and yield stress of complex fluids. Together, these parameters will support setting of process conditions.



POST-MANUFACTURING, MATERIAL SELECTION & QC

STRENGTH & FLEXIBILITY TESTING

Biopolymers must have suitable mechanical properties for their intended use. This includes tensile strength, elasticity, and flexibility. Achieving the right balance of these properties can be challenging, especially when trying to match or exceed traditional plastics.

SOLUTION

Understand important strength properties like yield strength, ultimate strength, and fatigue life to determine if the material will perform in an application. These test can all be performed on a load frame powered by an electromagnetic motor.



BARRIER PROPERTY TESTING

Biopolymers generally have poorer barrier properties compared to synthetic polymers, which can limit their use. Understanding how they behave in different environmental conditions is critical for end applications.

SOLUTION

Characterize your biopolymer's glass transition, modulus, or stiffness in controlled temperature and humidity conditions using a Dynamic Mechanical Analyzer (DMA). This instrument can additionally provide insights on damping, creep, and stress relaxation.



WHEN SOURCING A BIOPOLYMER

CONSISTENCY TESTING

Sourcing a consistent material is critical to the success of the product's use in the market. Often, biopolymers are a blend of materials. Testing and understanding how each of these materials works together to form a final product is very important for success.

SOLUTION

Measuring crystallinity and composition are two ways to quality control a source biopolymer resin and ensure you are getting the right material. The strength or brittleness, degree of opacity, and density of a material depend on both the composition and crystallinity. A Differential Scanning Calorimeter (DSC) and Thermogravimetric Analyzer (TGA) are your solutions to understand these properties of your biopolymer material.

