



CENTER FOR COMPOSITE MATERIALS
AT THE UNIVERSITY OF DELAWARE

MATERIALS CHARACTERIZATION CAPABILITIES

2026

The Materials Characterization Laboratory consists of thermal analysis, mechanical, and spectroscopic characterization facilities. The laboratory is used to establish the basic molecular and microstructure of materials as well as the thermal, optical and electronic macroscopic properties. Key equipment includes a comprehensive thermal analysis facility including NETZSCH, Mettler Toledo, and TA Instruments equipment. The facility contains the latest version of standard thermal analysis equipment such as DSC, TGA, DMA, TMA, and Parallel Plate Rheology, as well as some specialized equipment such as Mettler Toledo's Flash DSC.

Testing Capabilities

Rheology Testing

Rheology is used to determine minimum viscosity, pot life, and viscosity change during resin curing.

Differential Scanning Calorimetry (DSC)

DSC is used to determine the glass transition temperature of cured composites, optimize time-temperature cure cycles, and determine the kinetics of reaction.

Thermogravimetric Analysis (TGA)

TGA is used to determine volatiles, resin and fiber content of composites and prepreps, as well as the amount of sizing present on fibers.

Light Flash Thermal Diffusivity

Thermal diffusivity is a measure of the consolidation of the fiber and resin in a composite. Higher consolidation yields higher thermal diffusivity.

Dynamic Mechanical Analysis (DMA)

DMA is used to determine the glass transition temperature for polymers and composites, as well as changes in modulus as a function of time and temperature, including measurements under immersion.

Fourier Transform Infrared Spectroscopy (FTIR)

FTIR analyzes the chemical functional groups present in a prepreg or composite. The system at CCM can carry out measurements in the near- and mid-IR wavelength regions. Samples can be analyzed in transmission and reflection modes.

Hot Stage - Video Microscopy

This equipment allows observation of transient changes in the sample such as bubble formation, color change (from decomposition), and motion due to stress relaxation as a function of time and temperature.

DiaStron Single Fiber Tension Tester

This system automates the testing of single filaments of high-performance fibers to determine tensile strength, modulus, and strain at failure.



Equipment

- NETZSCH Differential Scanning Calorimeter (DSC)
- NETZSCH Thermogravimetric Analyzer (TGA)
- NETZSCH Light Flash Thermal Diffusivity
- NETZSCH Advanced Kinetics Software
- NETZSCH Thermomechanical Analyzer (TMA)
- NETZSCH High Pressure DSC (HPDSC)
- NETZSCH Immersion DMA
- METTLER Hotstage-Video Microscopy
- METTLER XP2U Balance Sensitivity 0.1 µg
- Perkin Elmer - FTIR Spectrometer with Microscope
- Waters DHR Rheometer
- DiaStron Single Fiber Tension Tester
- DATAPHYSICS Dynamic Contact Angle
- MICROMERITICS Density by Gas Pycnometry
- X-RITE Haze Measurement
- SURFACE MEASUREMENT SYSTEMS DVS - Dynamic Vapor Sorption

Discovery Development Deployment

Technical Contact:

Joseph Deitzel, Ph.D.
jdeitzel@udel.edu

Steve Sauerbrunn, Ph.D.
sauerbru@udel.edu

101 Academy Street
Newark, DE 19716