

# MATERIALS CHARACTERIZATION CAPABILITIES

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

### Thermogravimetric Analysis

TGA is used to determine volatiles, resin and fiber content of composites and prepregs.

### Light Flash Thermal Diffusivity

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

### Dynamic Mechanical Analysis

DMA is a sensitive method for measuring the glass transition of a highly filled composite. DMA also measures the energy absorbing properties of polymers and composites.

### Fourier Transform Infrared Spectroscopy

FTIR analyzes the chemical functional groups present in a prepreg or composite. The FTIR can be used in transmission mode for thin, clear samples. It can be used in reflection mode for opaque samples. This is used to identify small defects near the surface and analyze surface contaminants of composites.

### Hot Stage - Video Microscopy

This equipment allows one to record a microscopic image/video as the sample is heated in a controlled fashion. This is valuable for observing transient changes in the sample such as: bubble formation, color change (from decomposition), and motion due to stress relaxation.

### DiaStron Single Fiber Tension Tester

The DiaStron is a single fiber tension tester. The fiber is pulled taut and a laser interferometer measures the fiber diameter. The modulus and strength are calculated with the software. The measurements are more accurate because the diameter of the actual fiber tested



## 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)
- METTLER DSC
- METTLER Flash DSC
- METTLER TGA/DSC
- METTLER Dynamic Mechanical Analyzer (DMA)
- METTLER Hotstage-Video Microscopy
- METTLER XP2U Balance Sensitivity 0.1µg
- Perkin Elmer – FTIR Spectrometer with Microscope
- TA Instruments DHR Rheometer
- TA Instruments AR 2000 Rheometer
- DiaStron Single Fiber Tension Tester



## Technical Contacts:

Joseph Deitzel, Ph.D.  
302.831.0274 | jdeitzel@udel.edu

Steve Sauerbrunn, Ph.D.  
302.353.6046 | sauerbru@udel.edu

