

Polymers & Composites Solutions

As a leader in materials characterization, TA instruments provides the essential tools you need to develop, process, and test the next-generation polymers and composites. Whether you are optimizing formulation, qualifying for new material, or troubleshooting production, our instruments deliver the accurate, reliable data required for success.



Differential Scanning Calorimetry (DSC)

Measures heat flow associated with material transitions as a function of temperature or time. Characterize key thermal transitions to understand cure state, optimize processing cycles, and ensure final product quality.

Key Measurements: Glass Transition (T_g), Melting Point, Crystallization Temperature, % Crystallinity, Cure Enthalpy & Kinetics, Oxidative Induction Time (OIT)

Application Examples: Thermoplastics, Thermosets, Elastomers, Polymer Blends & Alloys, Adhesives, Prepregs, 3D Printing Filaments



Thermogravimetric Analysis (TGA)

Measures mass change vs. temperature or time in a controlled atmosphere. Quantify composition and thermal stability to ensure material specifications are met and predict long-term performance at elevated temperatures.

Key Measurements: Decomposition Temperature, Mass Loss Profile, Filler/Fiber Content, Char Yield, Moisture/Volatiles Content

Application Examples: Polymer Composites, Carbon Fiber/Glass Fiber Composites, Filled Polymers, Elastomers, Coatings, Additives, Flame Retardants



Dynamic Mechanical Analysis (DMA)

Measures viscoelastic properties as a function of temperature, time, or frequency. Gain crucial insights into understanding how mechanical properties like stiffness (modulus) and damping change with temperature and frequency to predict real-world performance under operational conditions.

Key Measurements: Glass Transition Temperature, Storage/Loss Modulus, Damping ($\tan \delta$), Creep, Stress Relaxations

Application Examples: Polymer Composites, Prepregs, Adhesives, Elastomers, Thermoplastics, Thermosets, Hydrogels





Rheology (Hybrid/ARES)

Measures flow and deformation behavior of liquids, melts, pastes, and soft solids. Characterize viscosity and viscoelastic properties of polymer melts and resins to optimize processing conditions like molding and extrusion.

Key Measurements: Viscosity, Resin Flow Properties, Storage/Loss Modulus, Yield Stress, Prepreg Tack, Cure/Gel Time, Thixotropy

Application Examples: Polymer Melts, Thermosetting Resins, Adhesives, Gels, Pastes, Prepregs, Polymer Solutions



Mechanical Testing Instruments (Electroforce Load Frames/APEX)

Measures material mechanical properties through efficient monotonic (tensile), DMA, and fatigue testing. Determine ultimate mechanical properties of your finished parts and materials. Quantify strength, stiffness, and durability to validate designs and ensure they meet demanding application requirements.

Key Measurements: Elastic Modulus, Stiffness, Yield Strength, Ultimate Strength, Elongation at Break, Fatigue Life, Fracture Toughness, Creep Compliance

Application Examples: Reinforced Plastics, Polymer Composites, Molded Components, Films, Fibers, Elastomers, 3D Printed Parts, Adhesives



Thermomechanical Analysis (TMA)

Measures dimensional changes vs. temperature, time, or force. Accurately measure the Coefficient of Thermal Expansion (CTE) to predict dimensional stability and prevent failure due to thermal stress, especially in composite materials or over-molded parts.

Key Measurements: CTE, Softening Temperature, Dimensional Change

Application Examples: Composite, Polymers, Films, Fibers, Adhesives, Printed Circuit Boards



Thermal Conductivity & Diffusivity Analyzers (DLF Series)

Measures a material's ability to conduct heat and the rate of heat propagation. Is your material an insulator or a conductor? Characterize thermal transport properties to design effective thermal management strategies for applications from electronics to insulation.

Key Measurements: Thermal Diffusivity, Thermal Conductivity, Specific Heat Capacity

Application Examples: Polymer Composites, Thermal Interface Materials (TIMs), Foams, Insulators, Conductive Polymers, Encapsulants