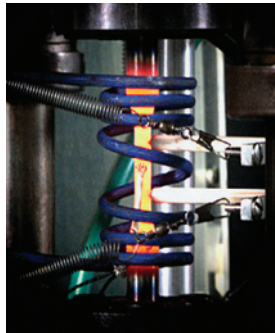


The Mechanical Characterization and Analysis User Center (MCAUC) is one of six user centers in the High Temperature Materials Laboratory (HTML), which is a DOE User Facility dedicated to solving materials problems that limit the efficiency and reliability of systems for power generation and energy conversion, distribution, storage and use. The MCAUC provides world-class facilities and a staff of technical experts for the mechanical characterization of functional and structural materials.

The MCAUC performs mechanical testing and analysis and develops test methods and supplemental analytical techniques. Numerous mechanical test frames with uniaxial and multiaxial capabilities are available to visiting researchers from industry and academia to conduct tests in tension, compression, flexure, torsion, shear, and internal pressurization in controlled environments over a wide range of temperatures and strain rates using standard or customized specimens. Facilities also include equipment for micromechanical testing and instrumented indentation. Staff has expertise with a wide range of materials, testing configurations, analytical modeling, stress, failure and life-prediction analysis of materials and structures.

Universal Test Facility

- Electromechanical and servohydraulic testing machines with load capabilities of up to 500 kN for monotonic or cyclic tests in tension, compression and/or torsion
- Actuator speeds up to 18 m/s and testing frequencies of 3000 Hz
- Load train configurations with fixed or self alignment
- Active and passive grips for a wide array of specimen geometries
- Digital controllers for load, displacement, or transducer-driven control, and computerized data acquisition



Dynamic Mechanical Analysis

- Dynamic mechanical analyzer with capabilities from -70°C to 600°C in air or controlled environment

Test Machine for Automotive Crashworthiness (TMAC)

- World's first integrated virtual and physical test system for high-force, high rate crashworthiness experiments on materials and structures
- Hydraulic system with load capacity of 267 kN dynamic, 490 kN static force at impact velocities greater than 8 m/s (18 mph)



Resonant Ultrasound Spectroscopy (RUS) Facility

- Characterization and inspection of mechanical integrity of test specimens and components
- Determination of the elastic constants of isotropic and anisotropic materials as a function of temperature and environment

Environmental Testing

- Environmental chambers for testing in inert environments, vacuum or pressurized simulated environments (e.g., steam) over a wide range of temperatures
- Infrared, induction and resistance heating



Mechanical Properties Microprobes

- Nanoindenters capable of operating at various load ranges and up to 400°C with constant monitoring of load and position of indenter
- Spherical, flat, and sharp indenter tips

Raman Spectroscopy

- Measurements of stress, phase content, and structure in nonmetallic materials with a spatial resolution of ~2 μm
- Laser and optics optimized for operation in UV, which allows for Raman spectral measurements up to 1500°C
- Loading fixture for in situ measurements and fiber optics
- for remote sampling

Fourier Transform Infrared (FTIR) Spectroscopy

- Optical spectrometer for FTIR with a range of 7,400–350 cm⁻¹ and spectral resolution of 0.125 cm⁻¹
- System attached to an IR microscope with spatial resolution of ~10 μm

Fixtures, Accessories, and Special Configurations

- Fixtures for uniaxial and biaxial bending, Iosipescu shear testing, anti-buckling compression, and double-torsion for determination of fracture toughness

Additional MCAUC Capabilities

- Infrared imaging
- High-speed video extensometry
- Acoustic emission system
- Strain-gaging facilities
- Internal pressurization of tubular components



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