

**CAPABILITY STATEMENT: MATERIALS AND STRUCTURES**  
**INSTITUTION: UNIVERSITY OF NEVADA, LAS VEGAS, HOWARD R. HUGHES COLLEGE OF ENGINEERING**

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## OVERVIEW

UNLV has laboratories and facilities to select, synthesize, characterize, design, and develop materials with the physical and mechanical characteristics necessary to handle their intended environments, including temperature, shock, and radiation. We also test materials and structures. Examples of recent research in this area include experimental characterization of shock propagation and failure mechanisms in complex materials, development of hybrid thermoelectric materials, and super-hydrophobic surface-enabled microfluidic energy conversion.

## RESEARCH CAPABILITIES

Structural analysis, failure analysis, experimental mechanics, structural dynamics, explosives, impact analysis, computational simulation of highly dynamic events, material characterization, custom component testing, crystal structure characterization, electroactive polymers for aerospace and ground applications, electrochemical processes, Nanostructuring, and surface modification.

## FACILITIES

**Active Materials and Smart Living Laboratory (AMSL)** includes:

- Fabricating and synthesizing light absorbing materials,
- Hydrophobic/hydrophilic materials and thermal analysis,
- Diamond DMA,
- TGA machine, differential scanning calorimeter,
- FT-IR spectrometer,
- UV-Vis spectrophotometer, contact angle meter,
- Injection molders,
- Vibration test system (TIRA),
- CCD laser sensor,
- Micropipettes,
- Vacuum chambers/gauges,
- MKS mass flow meters with computer controls,
- Spin coater,
- Laser displacement sensor,
- High temperature furnace, and
- Tube furnace, etc.

**Structural Engineering Laboratory** has a high-bay area fitted with a strong floor and allows large-scale structural testing. The main floor area is 75-ft. long and 40-ft. wide. The strong floor is comprised of a 32-ft. long, 28-ft. wide, and 4-ft. thick reinforced concrete slab with a matrix of embedded anchors and two steel reaction frames. Each frame permits applying a lateral load up to 200 kips. The structural testing system includes:

- Hydraulic closed-loop actuators for static and dynamic testing,
- Digital controllers for high-speed motions, and
- High-speed data acquisition system

**Center for Materials and Structures:** Experienced with standard material characterization and component testing (up to 1500°C, axial forces ranging from 25 – 50,000 lbs.):

*Mechanical Property Testing Facilities:*

- 1500°C inert gas furnace,
- 1000°C inert gas furnace,
- 2-zone heating capability,
- Lever arm creep test systems
- Instrumented drop weight impact system,
- Charpy pendulum impact tester

- (equipped with furnace), and
- 2-stage gas gun for ballistic impact (20-caliber projectiles up to 7.5 km/s),

*Thermal Treatment Facilities:*

- TGA/DSC, Furnace (1200°C) and
- Thermal aging oven.

*Composite Fabrication Facilities:*

- Autoclave (200°C, 100psi),
- Vacuum assisted resin transfer molding,
- Wet lay-up,
- Tooling fabrication,
- Polyurethane foam mixing, and
- Injection system.

**Microscopy:**

- Metallographic optical microscopy,
- Powder X-ray diffraction,
- Single crystal X-ray diffraction,
- Scanning electron microscopy,
- Electron probe microanalysis,
- Transmission electron microscopy,
- X-ray fluorescence spectrometer,
- X-ray photoelectron spectroscopy,
- Physical property measurement systems, and
- Imaging and electron microanalysis suite.

## PAST PERFORMANCE

NASA, Savannah River Nuclear Solutions, Defense Threat Reduction Agency, Environmental Protection Agency, Idaho National Laboratory, Los Alamos National Laboratory, NNSS (Nevada National Security Site), Naval Air Warfare Center Aircraft Division, Naval Research Laboratory, Nuclear Regulatory Commission, Oak Ridge National Laboratory, Office of Naval Research, Sandia National Laboratory, U.S. Department of Transportation, U.S. Army Research Office