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**Title:** Materials Characterization

**NAICS Code:** 541712-Research and Development in the Physical, Engineering, and Life Sciences

**Classification Code:** A-Research and Development

**Body:**

Sandia National Laborites (Sandia) seeks parties interested in utilizing world-class facilities to advance the research and understanding of the structure, composition and properties of materials. The Materials Characterization Department (01819) applies spectroscopic and diffraction techniques, light and electron microscopy, metallography, surface analysis, chemical analysis, and mechanical analysis to help develop better materials for applications as well as to develop lifetime performance predictions. We have considerable expertise and experience in solving material related issues for engineering components and structures. Additionally, failure analysis is performed on all types of materials including metals, ceramics, polymers, electronics and biological matter to resolve issues related to defective materials, unexpected loading environments, manufacturing process failures, in-service failures, inappropriate use and age-related degradation and defects. Many government agencies and industrial corporations utilize our services to provide an impartial and unbiased analysis of material related problems.

The Materials and Characterization Department at Sandia has the following capabilities and areas of expertise to support material analysis needs:

- **Aberration Corrected Scanning Transmission Electron Microscope with EDS capability**-for atomic scale resolution imaging, structural, elemental composition, and crystallographic information on the nanoscale and Energy Dispersive Spectroscopy (EDS) qualitative elemental analysis and mapping.
- **Microprobe**-for Wavelength Dispersive Spectroscopy (WDS) quantitative elemental analysis and mapping.
- **Scanning Electron Microscope**-for high resolution imaging, EDS, Electron Back Scattered Diffraction (EBSD) mapping for crystallographic orientation mapping, phase identification and texture in polycrystalline materials.
- **Dual Beam Scanning Electron Microscope/Focused Ion Beam**-for high resolution imaging, micromachining and in situ sample manipulation, “slice and view” serial sectioning and imaging, create TEM samples from bulk material, sample surface cross-sectioning, 3-D EBSD and 3-D EDS.

- **X-ray Diffraction Laboratory**-for structure analysis, thin film analysis, texture-macrostrain analysis, nanopowder characterization, in situ experimentation, Multivariate Analysis (MVA), neutron diffraction, high resolution powder X-ray Diffraction (XRD), X-ray Fluorescence (XRF) hyperspectral mapping.
- **Analytical Chemistry Lab**-for general analysis: UV-VIS Spectrophotometer, Titration, Density and Ion Chromatography. For inorganic analysis: Inductively Coupled Plasma/Atomic Emission Spectrometry (ICP/AES), Inductively Coupled Plasma/Mass Spectrometry (ICP/MS), combustion analysis (LECO) and Laser Ionization Breakdown Spectroscopy (LIBS). For organic analysis: Gas Chromatography (GC), GC Mass Spectrometry, High Performance Liquid Chromatography/Mass Spectrometry (HPLC/MS), Ultrahigh Performance Liquid Chromatography/High Resolution Mass Spectrometry (UPLC/MS), and CHN analysis.
- **Surface Analysis Laboratory**-for imaging and depth profiling for systematic, layer-by-layer bulk sample analyses, Auger Electron Spectroscopy (AES), X-ray Photoelectron Spectroscopy/Ultraviolet Photoelectron Spectroscopy (XPS/UPS), Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS), stylus profilometry (DEKTAK), Atomic Force Microscopy/Scanning Probe Microscopy (AFM/SPM), Near-Edge X-ray Absorption Fine Structure (NEXAFS), and imaging NEXAFS.
- **Metallography Laboratory**-for microstructural analysis, cross sectioning, macro and micro optical imaging, comprehensive image analysis, laser scanning confocal microscopy, and macro and micro hardness testing and mapping.
- **Thermal-Mechanical Characterization**-for thermal analysis, rheological testing, mechanical testing, portable data acquisition, Gel Permeation Chromatography (GPC), water diffusion and uptake, thermal-cycling in chambers, SolidWorks and COSMOSWorks software for computer-aided design (CAD) and FEA analysis.

Access to laboratories and instrumentation is provided through Sandia staff and technologists. Full cost recovery is required. For more information visit: http://info.sandia.gov/materials/sciences/materials-performance/materials-characterization.html.

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For further information, contact Jim Aubert by email at jhauber@sandia.gov

**Keywords:** materials, characterization, research, development, failure analysis, structure, spectroscopy, composition, degradation, defects, imaging, mapping, profiling, rheological, permeation, thermal, mechanical, chemistry