



The University of Texas Rio Grande Valley Capability Statement

Institution: **The University of Texas Rio Grande Valley**

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OVERVIEW

The University of Texas Rio Grande Valley (UTRGV) was created by the Texas Legislature in 2013 as the first major public university of the 21st century in Texas. This transformative initiative provided the opportunity to expand educational opportunities in the Rio Grande Valley, including a new School of Medicine, and made it possible for residents of the region to benefit from the Permanent University Fund – a public endowment contributing support to the University of Texas System and other institutions. As one of the fastest growing regions in the nation, the Rio Grande Valley encompasses 4 counties (Hidalgo, Cameron, Starr, and Willacy) in south Texas along the border with Mexico, playing a crucial role in the state and national context, contributing to economic growth, cultural diversity, and serving as a hub for educational growth. UTRGV has campuses and off-campus research and teaching sites throughout the Rio Grande Valley including in Boca Chica Beach, Brownsville (formerly The University of Texas at Brownsville campus), Edinburg (formerly The University of Texas-Pan American campus), Harlingen, McAllen, Port Isabel, Rio Grande City, and South Padre Island. UTRGV, a comprehensive academic institution, enrolled its first class in the fall of 2015, and the School of Medicine welcomed its first class in the summer of 2016. Serving the communities throughout the Rio Grande Valley, UTRGV empowers successful futures, enhances daily life, and lets our region shine as a global innovator in higher education, bilingual education, health education, biomedical research, and emerging technology that inspires positive change. The mission of UTRGV is to transform the Rio Grande Valley, the Americas, and the world through an innovative and accessible educational environment that promotes student success, research, creative works, health and well-being, community engagement, sustainable development, and commercialization of university discoveries.

RESEARCH CAPABILITIES

UTRGV currently has sixteen major research units/centers, which highlight the areas of heavy research activity. These units/centers include: Center for Community Resilience Research, Innovation, and Advocacy; Institute of Neurosciences (ION); South Texas Center of Excellence in Cancer Research (ST-CECR); South Texas Diabetes and Obesity Institute (STDIOI); Center for Vector Borne Disease; Center for Sustainable Agriculture and Rural Advancement (SARA);

South Texas Space Science Institute; Center for Advanced Manufacturing Innovation and Cyber Systems (CAMICS); Industrial Assessment Center; Nanotechnology Center of Excellence; University Transportation Center for Railway Safety (UTCRS); Texas Manufacturing Assistance Center (TMAC); Center for Broadening Participation in Engineering (CBPE); Center for Latin American Arts; Human Mobility Institute Center (HMI), and the Center of Excellence in STEM Education (C-STEM). As research activity and productivity within UTRGV continues to expand, several Research Pathways have been identified as areas for potential growth: Data Sciences, Analytics and Security; Living on the U.S.-Mexico Border; Environment and Sustainability; Clinical and Translational Research; Space Sciences; Materials and Advanced Manufacturing; Innovation and Economic Impact. These pathways were strategically identified not only because of growth potential, but also for the possibilities for multidisciplinary engagement. Additionally, these are all subject areas and topics of great importance to the Rio Grande Valley and the communities and populations this region encompasses.

FACILITIES

UTRGV campuses collectively house the following major Instruments:

- **EverCool-II (Quantum Design):** Ever-Cool-II is a cryogen-free industry-leading Physical Property Measurement System (PPMS) for accurate measurement of physical properties of different materials, such as AC susceptibility, heat capacity, electrical transport, thermal transport within a wide range of temperatures (1.9-400 K) and under a wide range of magnetic fields (9T). This instrument is capable of reaching sub-Kelvin temperatures.
- **Bruker ELEXSYS (EPR spectrometer):** The Electron Paramagnetic Resonance spectrometer capable of measurements in a wide range of temperatures (5 K to 500 K) and detection of low spin triplet states. The ELEXSYS platform has high sensitivity (about 10^9 uncoupled electronic spins per gauss and a signal to noise ratio better than 3000:1 for the weak pitch), high resolution (up to 10^{-8} T), and wide flexibility. The system has a maximum magnetic field of ~ 1.5 T without a superconducting magnet. The high resonance field has a special advantage to study materials which the magnetic saturation reaches large magnetic fields. The accessories mainly include: Goniometer for the study of the angular dependence of EPR spectra (necessary to assess the orientation of carbon nanotubes and graphene within polymeric matrices, to quantify the magnetic anisotropy in magnetically ordered samples, and to determine the g tensor principal axis in single crystals). The UV irradiation system provides the possibility for in-situ irradiation of samples of interest in the microwave cavity, especially paramagnetic compounds/species/defects, or phase transitions via light irradiation. The instrument will be used in training students to conduct measurements of quantum states of matter (spin density distribution, hyperfine interaction between electron and nuclear spins, nuclear spin relaxation, electron-electron spin dipolar coupling).
- **JSM-7100F (JEOL): JSM-7100F** is a Thermal Field Emission Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM) with the stunning resolution of 1.2 nm. This instrument has a wide range of applications and is essential for industrial and academic labs: imaging of samples, studies of surface topography of materials, analysis of extremely small structures from different angles. It will be used to support training of students in SEM techniques with direct hands-on experience as well as conducting interdisciplinary research in areas of overlap of physics, chemistry, material science, and engineering.
- **PIONEER-2 (RAITH):** This instrument combines an Electron Beam Lithography (EBL) system and an analytical Scanning Electron Microscope (SEM). The EBL is indispensable in modern device fabrication at the micro- and nano-meter scale. The SEM is a high-resolution imaging process that is crucial for characterization of micro and nano devices after their fabrication.

- **X-ray Powder Diffraction: Bruker D2 PHASER 2nd Gen:** D2 PHASER is the desktop diffractometer for all X-ray powder diffraction applications in Bragg-Brentano geometry. It is equipped with an integrated flat screen monitor, an integrated PC, and an ultra-fast SSD drive. The D2 PHASER is ideal for laboratory or on-location operation with Plug'n Analyze system.
- **Atomic Force Microscope SOLVER (NanoScope, Veeco):** Nano NT-MDT and a high-resolution Atomic Force Microscope system (AFM)/Multimode is allows imaging in Contact AFM mode, Constant Height mode, Constant Force mode, Contact Error mode, Lateral Force Imaging, Spreading Resistance Imaging, Force Modulation microscopy, Piezoresponse Force, Intermittent contact mode, Phase Imaging mode, Semicontact Error mode, Non-Contact mode, Electrostatic Force Modes. Contact EFM: Scanning Capacitance Microscopy, Kelvin Probe Force Microscopy. Scanner 100x100x12um closed loop scanner, 3x3x3um open loop scanner. AFM resolution: 0.01 nm. Environments: Air and liquid measurements. Combined video optical microscopes, Build in 100x optical USB microscope. External: 500x optical microscope.
- **UV-Visible Spectroscopy, UV-5500 (PC) UV/VIS Spectrophotometer.**
- **SDT Q600 Simultaneous TGA/DSC:** The Q600 provides simultaneous measurement of weight change (TGA) and true differential heat flow (DSC) on the same sample from ambient to 1500 °C. It features a field-proven horizontal dual beam design with automatic beam growth compensation, and the ability to analyze two TGA samples simultaneously. DSC heat flow data is dynamically normalized using the instantaneous sample weight at any given temperature.
- **Thermo Scientific Nicolet iS5 FTIR Spectrometer:** The Thermo Scientific Nicolet iS5 FT-IR spectrometer provides superior FT-IR performance in a compact size. Combining flexible sample handling and leading Thermo Scientific OMNIC software, the Nicolet iS5 spectrometer is the ideal FTIR solution for advanced labs around the world.
- **Seven Channels Li-ion Battery Analyzer** (6-3000 mA, up to 5V) with Laptop and Software for R&D all Rechargeable Cells -BST8-3: This system provides most applications in battery testing fields such as electrode materials research, battery performance test, small-scale battery formation, capability grading, battery pack testing and etc.
- **DCS-10, Spark Plasma Sintering System, Thermal Technology LLC:** 10-Ton, 5000 A power supply, Ram alignment, die-set 10-50 mm (ID).

PAST PERFORMANCE

For the past several years, UTRGV has been on an upward trajectory for bringing in research funding. In Fiscal Year 2023, the total amount for research funding was \$78.3 million. The top federal sponsors UTRGV receives funding from include National Institutes of Health, National Science Foundation, US Department of Agriculture, Department of Energy, Department of Defense, Department of Education, and Department of Transportation.

The UTRGV Division of Research supports research through the following areas: Research Operations (Office of Sponsored Programs (proposal preparation and submission), Grants and Contracts (financial compliance and regulation) Grants Accounting Office (financial compliance and accounting)); Research Enhancement (identifying funding opportunities, proposal development, building collaborative research groups, trainings and workshops); Research Compliance and Export Control (research integrity, compliance with federal, state, and internal policies/procedures), Technology Licensing and Commercialization (technology transfer services, transfer of research products (discoveries, creative works, inventions, and processes) to the private sector), and Research Data Analytics (collects, verifies, and presents data to internal and external customers, develops research administration tools and systems for the Division of Research).