

Materials Processing and Testing

- Bruker D8 Advance Diffractometer System – state of the art x-ray diffraction system with a high precision, two-circle goniometer with independent stepper motors and optical encoders for the Theta and 2Theta circles. The goniometer is designed to operate horizontally and vertically. The vertical goniometer with long tracks for continuously adjustable measurement circles. The measurement height is 150 mm and the pre-defined measurement circle diameters are 435 mm, 500 mm and 600 mm. System includes HTK-1200N nickel coated, high vacuum oven chamber designed for use in the range of room temperature to 1200C.
- FEI Quanta 250 FEG field emission scanning electron microscope capable of generating and collecting all available information from any type of sample material. Versatile, high resolution low vacuum FEG SEM with extended low-vacuum capabilities. Vacuum modes include high vacuum ($<6 \times 10^{-4}$ Pa) to low vacuum (10 to 130 Pa) and ESEM mode (10 to 4000 Pa). Pre-aligned electron optical column for high resolution and beam stability. Includes a 1000C heating stage to heat samples and record in-situ morphological sample changes.
- Netzsch DSC HP/2/G Phoenix Dynamic High-Pressure Heat Flow Differential Scanning Calorimeter. Pressure range is vacuum to 150 bar and the temperature range is ambient to 600C (1 bar) and ambient to 450C (150bar, N2).
- Netzsch STA 449 F3 Jupiter Simultaneous Thermal Analyzer (TG-DSC/DTA Apparatus. Temperature range of room temperature to 1550C.
- Micromeritics ASAP 2020 Automatic Chemisorption Analyzer. High performance adsorption analyzer producing research grade analytical measurements for the determination of active metal surface area and dispersion by chemical adsorption and specific surface area and pore size distribution by physical adsorption.
- Agilent 7890A Series Gas Chromatograph Custom Configuration Includes the GC with flame ionization and thermal conductivity capability along with single flame photometric detector. An agilent 7693A autoinjector with 16 sample transfer turret, mounting post and parking post. Chemstation PC bundle with 32 bit capability.
- LabConco Protector SS Double Controlled Atmosphere Glove Box with Electronic pressure controls for main chamber and transfer chamber operation.
- FLIR Systems Inc. ThermaCAM SCM1000 with Thermal Imaging System Research RT Complete Package State of the Art 256 x256 Focal Plane Array solid state detector with over 65,000 elements; Focal point array that is fully calibrated for temperature measurement.



- Jeol 5600 lv Scanning electron microscope system with system six spectral imaging system pioneer EDSdetector; air cooled water recirculator.

- MTS Tytron system, MTS Micro-Force test system flextest SE Controller - plus 793.00 Flex Test SE automation (PC) System Software Key – Allows for static and dynamic testing over a very wide range of velocities (less than 1 micron/hr to 500 mm/second) and frequencies (0.001 hertz to 50 hertz).



- Loomis 232-16 DTM Extruder – Extrusion tonnage 16+ tons, Material cylinder (ID 2", length 8"), horizontal and vertical extrusion capability, extrusion speed (1-16 in/min) and variable pressure.



- Instron Model 5866 Material Testing System (capacity 2250 lbs) – Allows for testing and analysis of mechanical properties of ceramics & other materials; Capable of performing tension testing, 3 point and 4 point bending tests.

- Jaygo Inc Model SK6, Sigma Blade Lab mixer (1.5 liter working capacity) Alumina coating on the contact SS parts Adjustable blade rotation speeds (15 - 100 rpm), maximum torque up to 100mN.

- Excel Technologies XL42901 5-objective, inverted stage nikon epiphot light microscope w/EDIH digital camera and video communication hardware; 3.3 million pixel digital image resolution, image capture/storage and editing capability.

- Prolab Benchtop Mass Spectrometer with complete vacuum pumping system. Features include: 300 amu triple filter quadrupole, Dual (Faraday/Channeltron multiplier) detector assembly, ultra low flow capillary inlet for atmospheric sampling, 110 volt internal heater jacket and Thermo ONIX's automatic calibration software for quantitative gas measurement with matrix inversion algorithms.

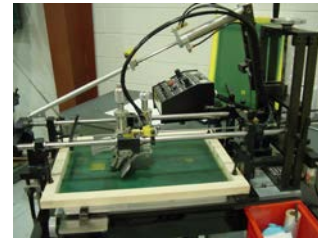


- Netzsch Electronic Dilatometer for measurement of thermo coefficients of expansion, Model DIL 402 PC/2/H. Temperature range up to 1500°C.

- CARVER Hydraulic Lab Press - with heated platens including 2 gauge manifold.



- Systemic automation screen printer for MEA fabrication



- Thermotron SE-600-3-3 Environmental Chamber. Chamber volume is 21.2 cubic feet with which occupies a workspace of 40" wide x 27" deep x 34" high. Approximately 1000 cfm airflow with a 6 kW heater. Operating temperatures from -70°C to 170° C.



- Fisher Scientific Isotemp Lab Oven (pg 929)
- Carver 12 Ton Lab Press (13-872)
- Denver Instrument M Series Analytical Lab Balance, M-310, 0 to 310 grams.
- Allied Hightech Products TechCut 4 Precision low speed saw