The Central Analytical Facility at The University of Alabama

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The Central Analytical Facility (CAF) mission is support in teaching, research and service for The University of Alabama. Located in Tuscaloosa, The University of Alabama is the Capstone institution for the University of Alabama System. The CAF is a première microanalytical and microstructural characterization facility within the Southeast region, assisting on and off campus academic research institutions with characterization needs. The CAF staff provides training and operational assistance in using the suite of analytical instrumentation. The CAF staff provides hands-on training to users. Instrument reservations and project management is handled through the Alabama Research Management System (ARMS). The following is a listing of the CAF instrumentation:

FEI QUANTA 200 3D FIB/SEM

Magnum focused ion beam and SEM, thermionic electron source, fully automated stage, platinum deposition, Omniprobe AutoProbe 200 *in situ* micromanipulator, ESEM and VP mode, BSD, LFD, STEM detectors, EDAX TEAM Pegasus (Hikari & X-Max 30mm²) simultaneous collection of EDS and EBSD data, allowing correlation of elemental composition and crystal size/orientation

THERMO SCIENTIFIC APREO-S

FE-SEM with a revolutionary compound lens design combines electrostatic and magnetic immersion technology to yield unprecedented resolution and signal selection. This makes the Apreo SEM the platform of choice for research on nanoparticles, catalysts, powders and nanodevices, without compromising on magnetic sample performance The Apreo SEM benefits from the unique in-lens backscatter detection named the Trinity detector system, which provides excellent materials contrast, even at tilt, short working distance, or on sensitive samples. The novel compound lens further improves contrast with energy filtering and adds charge filtering for imaging of insulating samples. EDAX TEAM Pegasus-Octane Elite Super (70mm²) and Hikari Super, enables the simultaneous collection of EDS and EBSD data allowing correlation of elemental composition and microstructure

CAMECA 5000 XS LOCAL ELECTRODE ATOM PROBE

New TOF - flight path technology with enhanced detector performance to offer improved field of view with increased detection efficiency ~ 80%. Voltage mode and advanced UV laser pulse module capable of offering repetition rates of up to 2 MHz increases efficiency and productivity. Plasma cleaner, enhanced productivity package and digital eFIM with argon, neon or helium

TESCAN LYRA-3 XMU FIB-FESEM

Field emission-SEM and FIB. Fully motorized, heavy-duty compucentric 5-axis stage (X&Y=130mm, Z=100mm, Rotation=360º, bidirectional tilt = -30º to +90º, 8kg weight capacity). Five (5) port GIS system – platinum & carbon deposition, H_2O & XeF enhanced etching, SmartAct Piezo *in situ* micromanipulator, DrawBeam nano- lithographic patterning & milling software, serial slice & view software, YAG BSD, R- STEM, variable pressure to 500 Pa low vacuum, ultra-high resolution image acquisition - 16k*16k pixels, 16-bit. EDAX TEAM Pegasus- Octane Elite-55 and Hikari Super, enables the simultaneous collection of EDS and EBSD data allowing correlation of elemental composition and microstructure

JEOL 7000F FE-SEM
NSF-DMR-0321180

Field emission SEM, 0.5 to 30kV, magnification 10X to >500kX, 5-axis stage large airlock, up to 8” stage, STEM & BSE detectors, probe current from 1pA to >200nA, with ACL, NPGS-60 Nabity e-beam lithography
Oxford Instruments complete AZTEC system
X-Max 80mm2 EDS, Nordlys II EBSD and WDS

KRATOS AXIS ULTRA DLD

X-ray photoelectron spectroscopy - XPS - system equipped with a dual (Al/Mg) and a monochromated Al X-ray source, and a parallel imaging electron analyzer. The instrument is capable of large area (700 x 300 μm) and small spot (15 μm) spectroscopy, and it has a spatial resolution (imaging mode) of < 3 μm. A small spot 5 keV Ar-ion sputter gun allows for depth profiling of samples. A charge neutralizer enables measurement of non-conductive samples (e.g. oxides). Equipped with a FE electron source for Auger spectroscopy and SEM applications

JEOL 8600 EPMA

Five WDS spectrometers, Advanced Microbeam upgrade (2007) with ProbeWin v 8.65 and Esprit 1.9.4 analytical software, combined EDS/WDS analyses, improved throughput& automation, powerful post-processing options, Bruker Xflash 5010 EDS detector, integrated SEM/BSE imaging & element mapping, Gatan Mini cathode luminescence detector

FEI TECNAI F20 TEM
NSF-DMR-0421376

200 keV FEG, point res = 0.24nm, information limit = 0.15nm, complete digital control (embedding of all detectors) 'conventional' and STEM mode, Gatan TRIDEM EELS, GIF, EDAX TEAM Octane T Optima EDS, STEM chemical mapping (point, line, 2D map) 3D STEM-tomography, HAADF (z-contrast imaging), ultra-high resolution imaging (exit wave reconstruction), digital microscopy (1k CCD camera) SIA-L3C 2k CCD live/slow scan camera for live image and diffraction, NanoMEGAS and ASTAR-EBSD of nanomaterials, TopSpin PED Scanned Acquisition Experiment Framework and AutoSTRAIN module, Hummingbird tomography holder

Gatan cryo stage & heating stage, double tilt, Hysitron PI 95 PicoIndenter, DENS Wildfire heating stage, up to 1,300 C Hummingbird tomography holder, Gatan cryo stage & heating stage, double tilt, Hysitron PI 95 PicoIndenter, DENS Wildfire heating stage, up to 1,300 C

BRUKER D8 DISCOVER XRD

2D Vantec 500 SSD, GADDS, copper & cobalt x-ray sources, phase ID, indexing, quantification, textural study, residual stress measurements, expansive software packages for specific analyses, increased sample throughput through automation and detector sensitivity, DIFFRACPLUS analysis suite, temperature control stage, ICDD database

Sample Prepataion Lab:

Gatan PIPS-II ion mill
Fishionne Model 150 dimple grinder
Cressington 208 HR sputter coater, Cr, AuPd, Ir
Cressington 208 carbon coater
BioRad Au coater
Simplex Scientific-Electro Pointer
SBT Model 515 dimple ginder
SBT Model 360 disc cutter
SBT Low speed diamond saw