Georgia Tech Materials Characterization Facility

www.mcf.gatech.edu

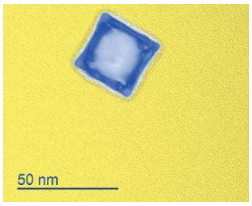
The Georgia Tech Materials Characterization Facility is pleased to offer TEM sample preparation, imaging, and analysis services to GT research groups and external academic & industrial researchers.

Available Services Include:

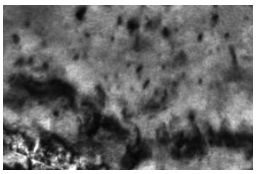
- Sample Preparation for metals, ceramics, semiconductors, etc
- Nanoparticle characterization for size and morphology
- TEM imaging of 1-D and 2-D extended lattice defects
- STEM/HAADF imaging of materials for Z contrast imaging.
- EDS/EELS for elemental and chemical analysis of phases and impurities.
- Nano diffraction for crystal structure determination,
- Evaluation of grain size, structure, and intergranular material,
- Secondary electron imaging for high-res surface feature inspection

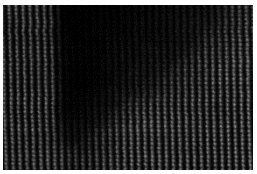
Upon receiving the request for sample preparation and/or microscopy, an MCF staff member will consult with the researcher to provide an estimated cost for the service.

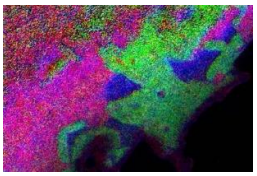
- $100/hr will be charged for preparation of samples by MCF staff
  - Routine preparations (e.g., sonication and drop casting) will typically take <2 hours (i.e., ~$200).
  - Hand-prepared cross-sections take a minimum of 5 hours (min. $500 per sample).
  - FIB preparation and lift-out will take a minimum of 5 hours per lamella (min. $750 per lamella).
- TEM imaging will be charged at a rate of $100/hr for the staff time plus the usage time for the TEM itself (see reverse side for rates).

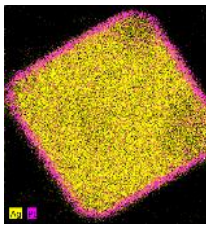


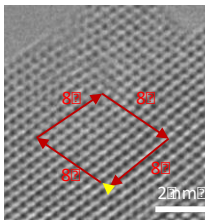
TEM image showing hollowed interior of cubic Au nano-cage.

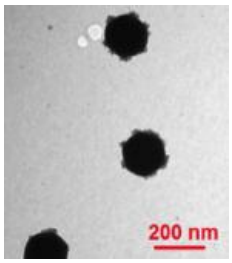

Dark-field TEM image showing dislocations in CeO_2


Atomic resolution HAADF STEM image of ZnO doped with Sb; dark area is a void

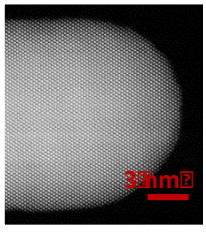

EELS map showing elemental distribution in a metal; red = C, blue = N, green = Al




Dislocation in CeO_2



Au particle with binder


Au nanorod

Contact Walter Henderson (walter.Henderson@gatech.edu) or Dr. Yong Ding (yong.ding@mse.gatech.edu) for details.

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Available instruments:

JEOL 100CX-II TEM

- Tungsten-filament source
- 100 kV instrument with digital imaging, for obtaining images up to 300,000X of biological, polymer, and materials samples.
- Accelerating Voltage: 20 ~ 100 kV; Resolution (lattice): 0.2 nm at 100 kV
- **$30/hr – academic; $100/hr – industry**

Hitachi HT7700 TEM

- LaB_6 high-brightness source,
- 120 kV digital TEM for imaging nano-material specimens.
- Separate modes for low magnification/ High Contrast imaging (up to 200,000X) and high magnification/ High Resolution imaging (up to 600,000X).
- Accelerating Voltage: 40 ~ 120 KV; Resolution (lattice): 0.2 nm at 100KV
- **$40/hr – academic; $100/hr – industry**

FEI Tecnai G2 F30 S-TWIN TEM

- 300 kV thermally-assisted field emission gun
- A multi-purpose 300 kV in-situ TEM experimental platform capable of atomic resolution
- Combines excellent performance in all TEM, EFTEM & STEM modes with ease of operation in a multi-user environment.
- New state-of-the-art Gatan OneView camera, which can record video at 25 fps at full 4k x 4k resolution, and at 300 fps for a 512 x 512 pixel sub-area.
- **$80/hr – academic; $160/hr – industry**

Hitachi HD-2700 dedicated STEM

- A 200 kV TEM with a cold field emission gun source
- Spherical aberration (C_S) correction, and high resolution objective lens enable atomic resolution imaging
- Secondary electron detector for atomic resolution SEM images
- 60 mm^2 EDS detector for high-resolution elemental analysis.
- Image resolution 0.136 nm HAADF-STEM / 0.105 nm FFT 8M X
- **$80/hr – academic; $160/hr – industry**

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