

NNCI: The Virginia Tech National Center for Earth and Environmental Nanotechnology Infrastructure (NCE²NI)



Marina E. Vance¹, Peter J. Vikesland³, F. Marc Michel², Weinan Leng³, Matthew Hull¹, William Reynolds^{1,4}, Mitsuhiro Murayama⁴, Linsey C. Marr³, Amy Pruden³, Michael F. Hochella, Jr.^{1,2}

¹Institute for Critical Technology and Applied Science, Virginia Tech

²Department of Geosciences, Virginia Tech

³Department of Civil and Environmental Engineering, Virginia Tech

⁴Department of Materials Science and Engineering, Virginia Tech

NNCI nano



VT NCE²NI
supports users who work
with the nanoscience and
nanotechnology
aspects of geological and
environmental sciences and
engineering.

Our mission

To fully support external researchers who work with nanoscience- and nanotechnology-related aspects of the Earth and environmental sciences/engineering at local, regional, and global scales, including the land, atmospheric, water, and biological components of these fields.

VT NCE²NI covers analytical, synthesis, experimental, and field work, as well as local, regional, and global aspects of these areas of study.

Areas of study represented:

- Geology
- Geochemistry
- Biogeochemistry
- Civil and environmental engineering
- Environmental sciences
- The subfields of the biological sciences as they relate to these and other disciplines.

Environmental Molecular Sciences Laboratory

NCE²NI has established an agreement to accelerate the access of users for EMSL at the Pacific Northwest National Lab (PNNL), a national scientific user facility operated by Battelle for DOE BER.

234,000 square feet, 150+ instruments, roughly 220 staff

Key Facilities

- Mass spectroscopy
- Microscopy
- Molecular Science Computing
- NMR and EPR
- Spectroscopy and Diffraction
- Subsurface flow and transport
- Cell isolation and systems analysis



NCE²NI locations

Nanoscale Characterization and Fabrication Laboratory (NCFL)

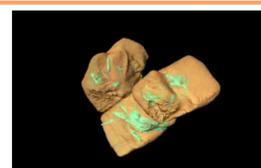
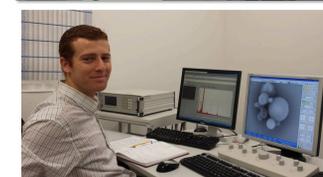
The 15,000 sq. ft. Nanoscale Characterization and Fabrication Laboratory (NCFL) houses a broad array of state-of-the-art electron- and ion-beam characterization tools, as well as office space for staff and visitors.

The NCFL was created to provide researchers with the tools to work in converging disciplines at these dimensions. Established in 2007, it is an initiative of the Institute for Critical Technology and Applied Science at Virginia Tech. The facility is equipped with more than \$15 million of highly specialized equipment. It seeks to help researchers investigate novel phenomena and build transforming technologies that solve critical challenges.



Facilities

- Suite of electron, x-ray, ion, photon beam instruments:
 - 4 **TEMs** (+ 1), 2 **SEM's**, **FIB**, **SIMS**, **XPS**, **AFM**
- 2 **ICP-MS**, **ICP-OES**
- Sample preparation labs
- Computer data analysis labs
- Room for 20-30 visitors, short or long term (desks, meeting, eating).



TEM tomography reconstruction of ~ 30nm hematite (Fe₂O₃) particles with ~3nm wide internal channels (green).



VT Center for Sustainable Nanotechnology:

VT SuN

Facilities includes a 3,300 sq. ft. laboratory with extensive nanoparticle synthesis facilities and a wide array of benchtop analytical instruments.

Other areas available for NCE²NI users include an additional 3,000 sq ft. of meeting and office space for staff and visitors.

VT SuN facilities are equipped to help users prepare environmental samples for analysis and to synthesize many types of nanomaterials that are also naturally-occurring, so that they can be studied and better understood in the laboratory.

Our facilities are also equipped to produce many types of manufactured nanomaterials that can be inadvertently released into the environment, or used as an active agent in environmental remediation, or used in a nanomaterial-enabled detection device.

In all of these cases, laboratory production of these nanomaterials in carefully controlled experiments have a much higher degree of quality control (in terms of precise compositions, and more uniform sizes and shapes) than equivalent commercially available nanomaterials.

Facilities

- **AFM and AFM/Raman**
- Benchtop analysis: **UV-Vis-NIR**, **BET**, **DLS**, **UF**, ...
- Nanosynthesis, experimentation, and reactivity labs
- Bio culturing, growth, reactor facilities
- Aerosol generation and reactivity chambers
- Field expertise, and a suite of nano-field methods and tools.



Acknowledgements

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