ENGINEERING, COMPUTING AND APPLIED SCIENCES

SEEKING INDUSTRY PARTNERSHIPS:

ADVANCED IMAGING FACILITY

While the technology for synthesis of advanced nanostructured materials has rapidly advanced, the science, education, and workforce for 3-D dynamic characterization and imaging of complex systems at the nanometer scale is lacking.

For analysis of solids and liquids, the synchrotron photon sources producing intense X-ray beams that can deeply penetrate through the materials are of great interest for materials scientists. Typical beamlines in synchrotrons range anywhere from tens to hundreds of meters long. While attractive for materials research, these big synchrotrons cannot be easily built on university campuses and are not easily accessible to scientists from academia and industry.

We propose to create a **national facility for lab-scale synchrotron** screening providing initial data and screening experiments for both industry and the academic community.

PRE-PROPOSAL TO NSF

$40M

IMAGING SCALE

0.1 nm

TO BE HOUSED IN THE NEW ADVANCED MATERIALS INNOVATION COMPLEX (AMIC)

The Advanced Materials Innovation Complex (AMIC), a 4-story, 150,000 gross square feet, $130M building at Clemson University has been designed and is currently under construction. It will be completed in 2025. We aim to leverage the $130M state investment in AMIC by creating this National Facility within the new AMIC building.

A vibration controlled 2000 sq. ft. space with ample HVAC and power has been programmed in the building on the first floor for the development of this facility.

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A NATIONAL FACILITY

LAB-SCALE SYNCHROTRON

The facility will be equipped with a suite of X-ray-based equipment to study atomic and crystalline nanostructures (0.1 nm–100 nm range) and X-ray micro-CT microscopes for analyses of larger microstructures (> 100 nm) of biological organisms, polymer, ceramic and metallic materials, fibers, wires, and macroscale specimens.

BENEFITS TO INDUSTRY PARTNERS

- Access to testing equipment without the need to travel to national lab facilities
- Integrated data science, AI and machine learning applied to image analysis
- Training opportunities for current workforce
- Resource to support the development of the region's next-generation workforce—helping to attract the best and brightest to the upstate

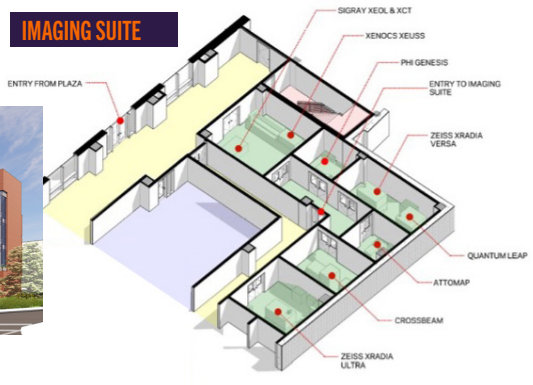
FACILITY CAPABILITIES

- Small and Wide Angle X-Ray Scattering
- X-Ray Absorption Spectroscopy
- X-Ray Fluorescence Spectroscopy
- X-Ray Photoelectron Spectroscopy
- X-Ray Excited Optical Luminescence Spectroscopy
- Transmission X-Ray Microscopy
- X-Ray Computer Tomography
- Crossbeam Focused Ion Beam – Field Emission Scanning Electron Microscopy

PROPOSED FACILITY LAYOUT

AMIC BUILDING

IMAGING SUITE



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BROADER IMPACTS

Establishing this national facility will allow for the expansion of X-ray-based methods not only to engineering materials, but for discovery in evolutionary biology, medicine, chemistry and physics.

- Advancing Scientific Research
- Accelerating Material Development
- Facilitating Technology Innovation
- **Strengthening Industrial Competitiveness**

Industries will gain access to state-of-the-art equipment and expertise for materials characterization and analysis. 3D based X-ray imaging techniques applied to defect analysis in existing products can help optimize existing manufacturing processes and facilitate new products and processes, improved quality control, and strengthen competitiveness in sectors of national importance including manufacturing, energy, electronics, textiles and composites, and pharmaceuticals.

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