NNCI: Southeastern Nanotechnology Infrastructure Corridor

SENIC provides modern facilities and a broad collection of tools for top-down and bottom-up nanoscale science and engineering research in the southeastern US.

Access and training promotes a culture of open-access to foster research, education, and outreach in diverse fields.

Georgia Tech Institute for Electronics and Nanotechnology

JSNN Joint School of Nanoscience and Nanoengineering UNCG

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SENIC: Team

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SENIC: Facilities and Tools

Heidelberg MLA150 Maskless Aligner

The fast speed, high-precision and simple operation made it the most popular tool shortly after it was installed, **requiring a 2nd installation.**

The MLA150 eliminates the need for making photomasks, thus greatly reducing the cost for testing new ideas.

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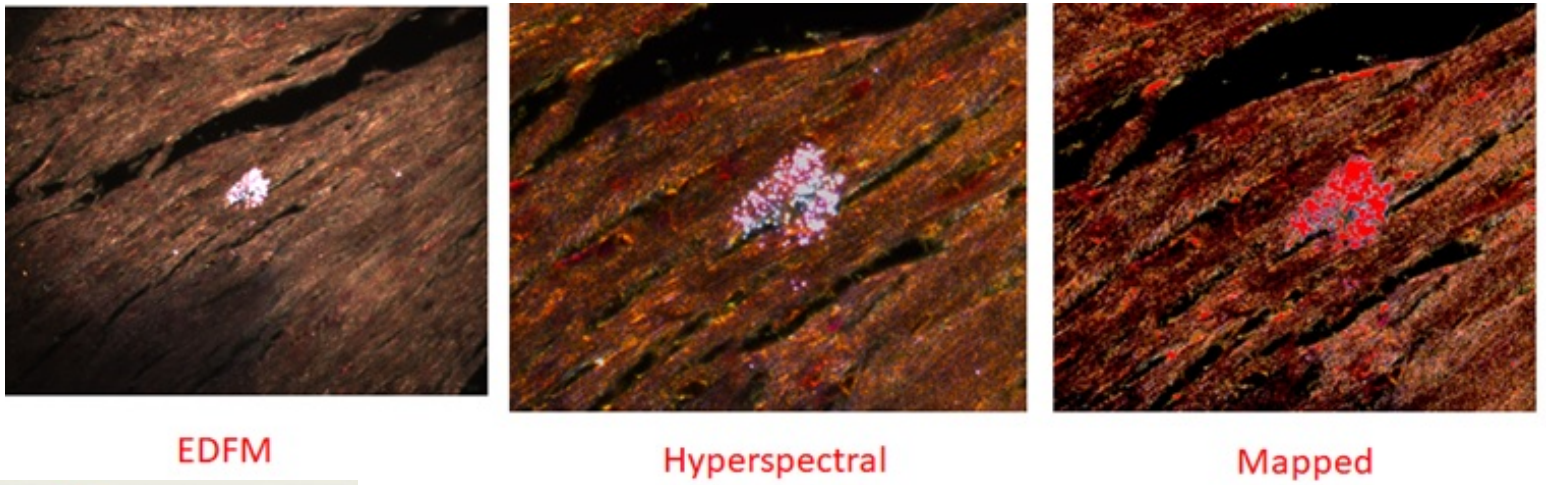
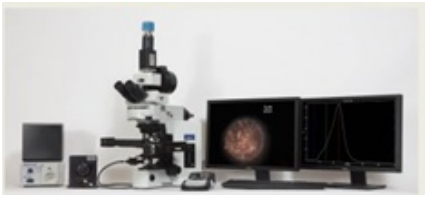
SENIC: Facilities and Tools

Enhanced Dark Field and Hyperspectral Imaging System

- Optical observation and spectral confirmation of unlabeled nanoscale samples as they interact with biologicals and composite materials
- Requires no special sample preparation, when compared to electron or confocal microscopy





Enhanced dark field and hyperspectral images of Ceria nanoparticles mapped in heart tissue of mice

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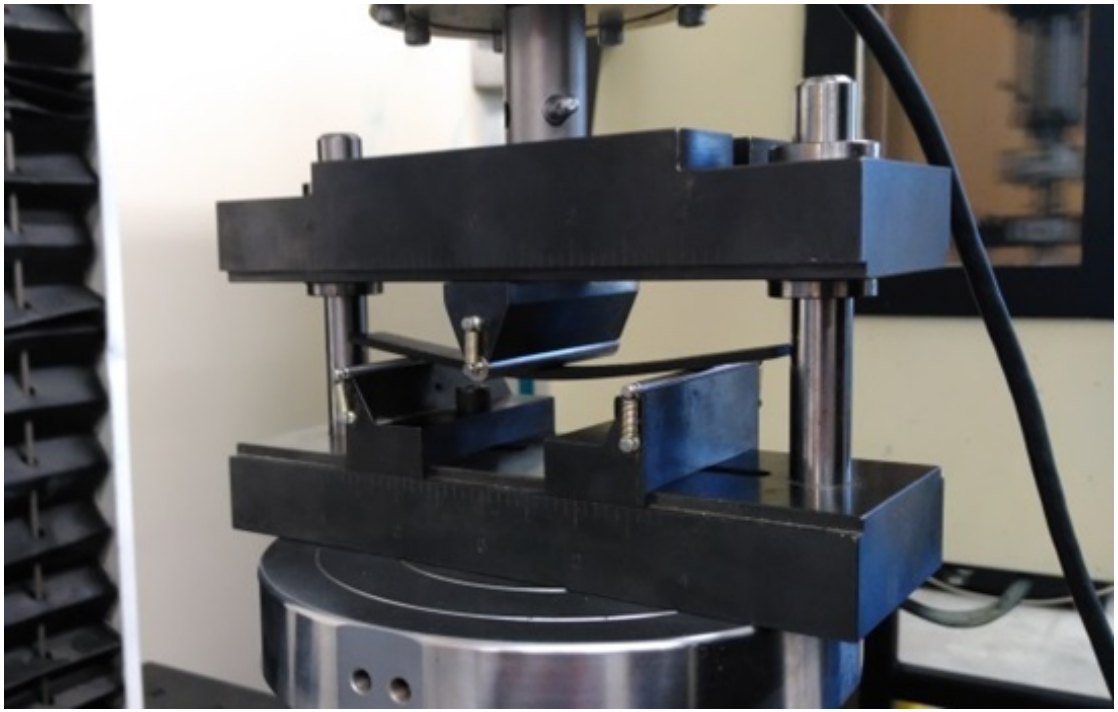
SENIC: Facilities and Tools

Unique Facility: Gateway Materials Test Center is a ISO/IEC 17025 Accredited Testing Facility



Provides ASTM, AATCC and ISO certified testing services for textile, composite, automotive and aerospace industries

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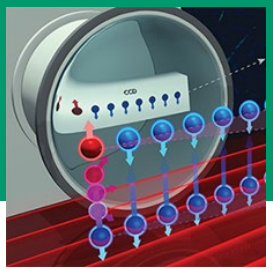
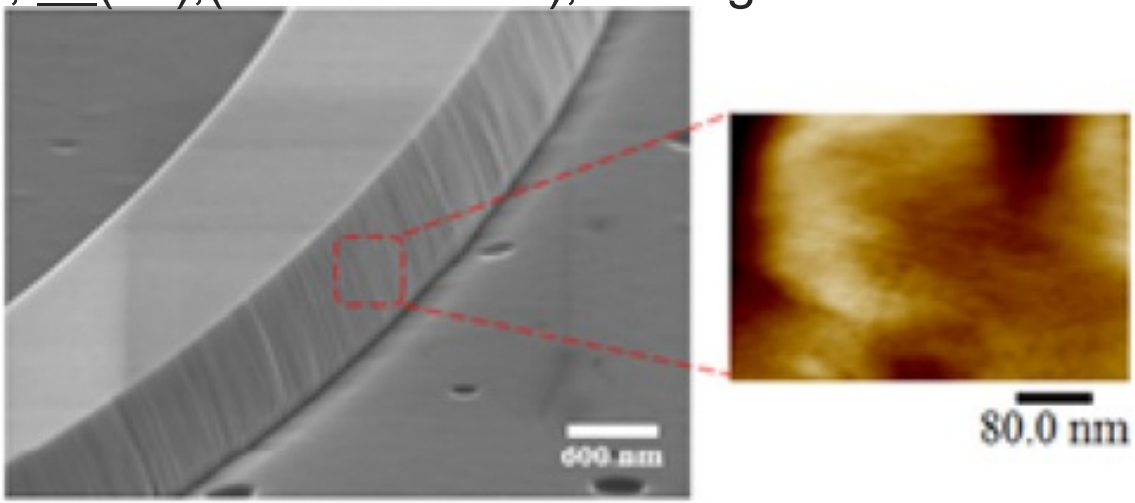
SENIC: Research Highlights



Georgia Tech (Internal) - Research Highlight

NSF Big Idea – The Quantum Leap Technology

T. Fan, H. Moradinejad, X. Wu, A. A. Eftekhar and A. Adibi, "**High-Q integrated photonic microresonators on 3C-SiC-on-insulator (SiCOI) platform**," Optics Express, **26**(20),(October 2018); doi.org/10.1364/OE.26.025814



(a) Zoomed-in angled-view SEM image of the microring resonator. (b) 2D AFM scan of sidewall.

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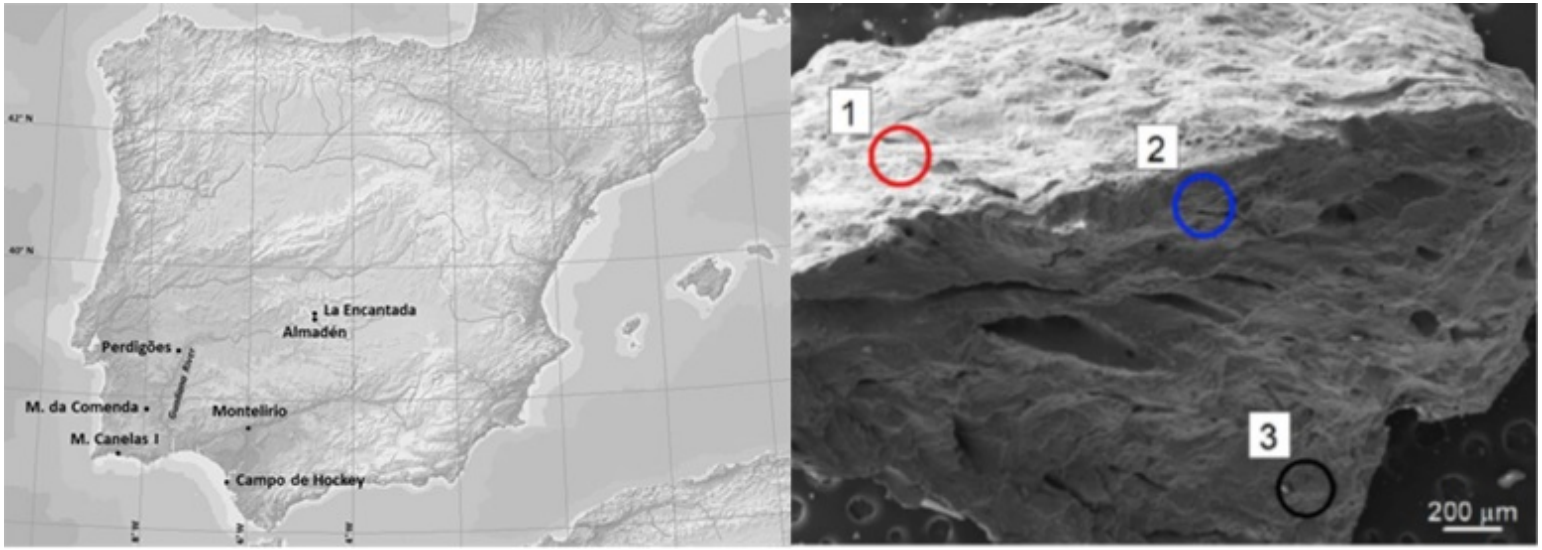
SENIC: Research Highlights

UNC Wilmington (External) – Non-traditional

NSF Big Idea – Understanding the Rules of Life

S. D. Emsliea, A. Aldermana, A. McKenziea, R. Brassob, A. R. Taylor, M. M. Moreno, O. Cambra-Moo, A. González Martín, A. M.Silvad, A. Valera, L. García Sanjuán, E. Vijande Vila, "**Mercury in archaeological human bone: biogenic or diagenetic?"**, Journal of Archaeological Science, **108** (2019) 104969



Iberian archeological sites and bone sample.

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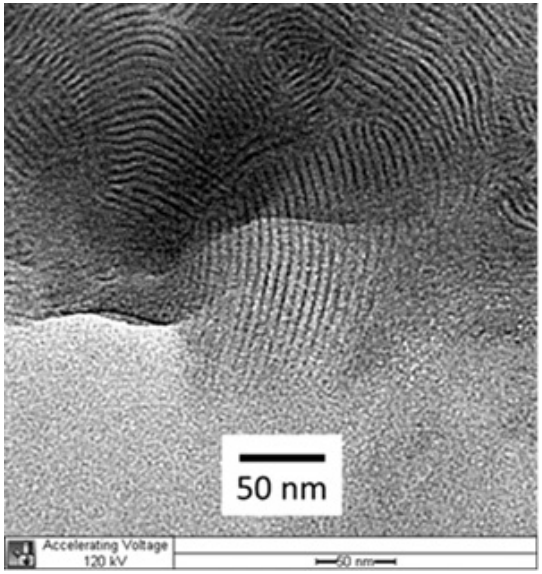
SENIC: Research Highlights - Internal

JSNN (Internal) – Bottom-up Fabrication

NSF Big Idea – Growing Convergence Research

H. Rathnayake, G. Pathiraja, D. Herr, "**Novel approach to sub-5-nm patterning platforms: the self-assembly of metal conjugated bio-inspired molecules**," Proc. SPIE 10958, Novel Patterning Technologies for Semiconductors, MEMS/NEMS, and MOEMS, **1095811**, (June 2019)

Bioinspired self-assembly of aligned 3 nm diameter metal (Ni) nanowires [Pitch ~ 6-7 nm]



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SENIC: Education and Outreach

NanoSIMST: Nano Summer Institute for Middle School Teachers

I am capable of teaching nanoscience in my classroom or lab.
Pre: 36% strongly disagree; 29% somewhat disagree; 21% neutral
Post: 53% somewhat agree; 47% strongly agree

"I came in knowing nothing about nanoscience, now I'm confident with teaching the basics to my 7th graders."

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SENIC: Societal and Ethical Implications

Goal: Increase attention to nanotechnology applications, while attending to social and ethical implications.

Finding: Concept mapping helps to evaluate the effects of the SEI video and workshop.

Post-Intervention Map Example

Compared to initial baseline concept maps, post-intervention concept maps showed improved the understanding of the multi-dimensionality of SEI including environmental, economic, geopolitical, and education and retraining dimensions.

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SENIC: Research Impact

- **Atlanta Center for Microsystems Engineered Point of Care Technologies (ACME POCT),** part of NIH Point-of-Care Technologies Research Network (POCTRN)

- **Center for Cell Manufacturing Technologies (CMaT) a NSF ERC at Georgia Tech**

- **Application and Systems driven Center for Energy-Efficient Integrated Nanotechnologies (ASCENT),** an SRC-funded JUMP (Joint University Microelectronics Program) Center

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SENIC: Economic Impact

NextInput develops MEMS force sensors, has received $30 million in venture capital funding and has begun mass production for automotive and mobile touch panel application

Sila Nanotechnologies recently received a $170 million investment from Daimler for automotive batteries.

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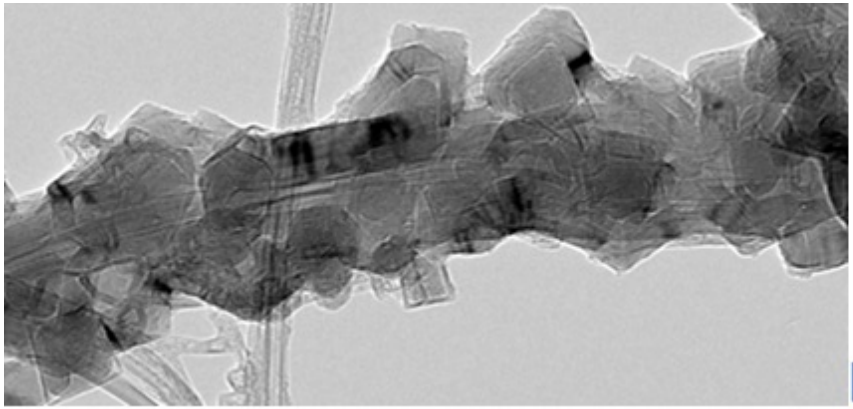
SENIC: Economic Impact

BNNano

BNNano created the world's first high-purity PET yarn doped with boron nitride nanotubes (NanoBarbs™), which is expected to compete as a low-cost alternative to aramids/Kevlar.



SENIC advanced material characterization facilities have helped BNNano in quality control and process verification.

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SENIC: Network Collaborations

- ***Shared Best Practices [The Whole > Sum of its Parts]:***
  - ***RTNN*** (Kickstarter) -> ***SENIC*** (Catalyst) -> ***KYMMNIN*** (Seed)
    - 12 Catalyst projects were awarded in 2019, thus far
  - Southeastern Nano Facility Network (**SENFN**) leveraged from **MINIC** and **MANTH**.
    - First Meeting was held at Georgia Tech IEN in Nov 2018
    - Next meeting will be held at Oak Ridge National Laboratory on Nov 14, 2019
- Additional NNCI related collaborators cited in the supplemental information document include
  - **NCI-SW, NNF, RTNN, SHyNE, SDNI and NanoEarth**

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SENIC: Panel Discussion

Resource Allocation and New Equipment

Looking Forward:

SWOT Analyses?

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