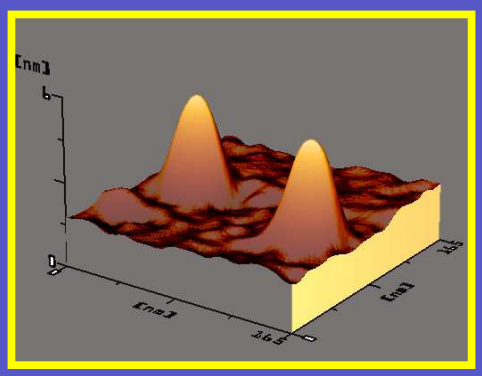
APPLIED RESEARCH CENTER

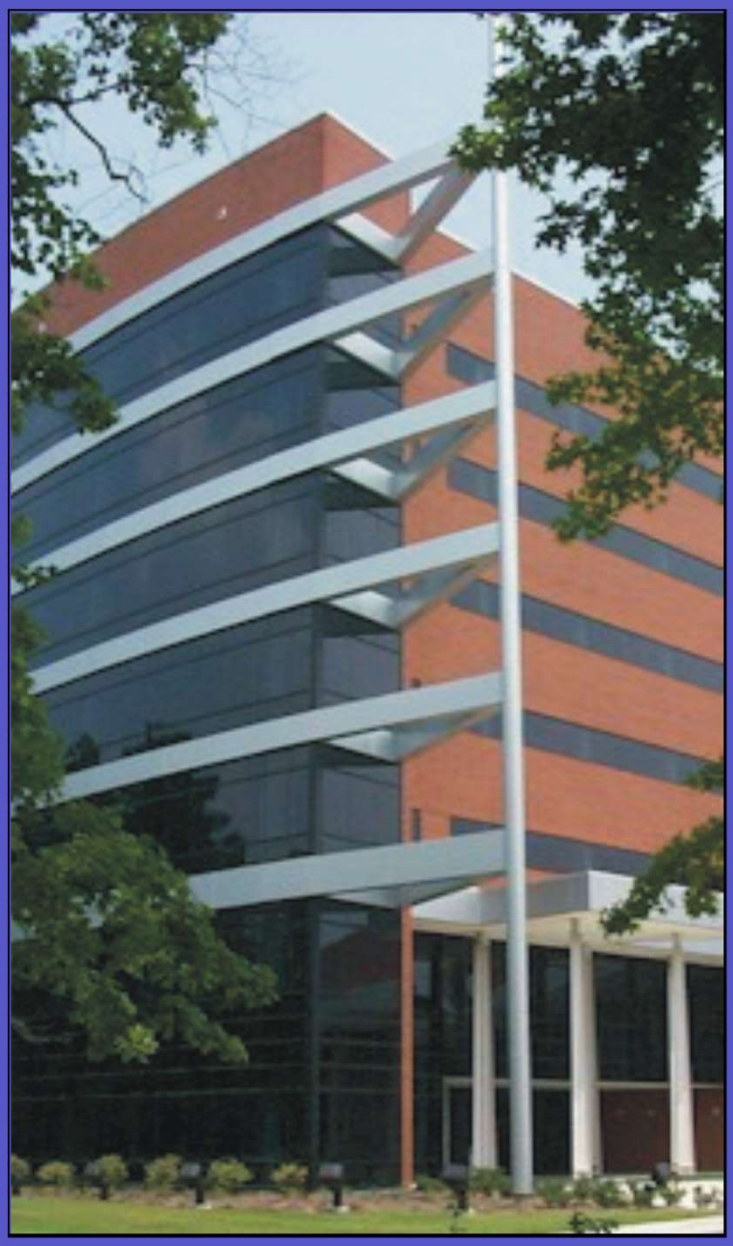
HIGH-TECH SOLUTIONS



NANOTECHNOLOGY

THIN FILM DEPOSITION

MATERIALS CHARACTERIZATION



Applied Research Center
Batten College of Engineering & Technology
Old Dominion University
Newport News, Virginia

Mission

To be the leader in research, development, and education, concentrating on laser and plasma applications and advanced materials.

Working to Innovate

What we are doing:

- Nanotechnology/Quantum Dots
- Laser Micromachining
- Nanotechnology for Lab-on-a-Chip Applications
- Alternative Renewable Energy and Bioapplications
- Solar Cells and Photodetectory
- Laser Induced Breakdown Spectroscopy
- Carbon Nanotubes and Nanoparticles
- Thin Films
- Advanced Sensors
- Electronic Materials
- Electron Beam Lithography
- Negative Electron Affinity Photocathodes
- Femtosecond Laser Technology
- Surface Modification with Plasmas
- Materials Characterization
- Ultrafast Laser Diagnostics
- High-k Dielectrics
- VUV Lithography

In the Laboratory

ARC has established 18 labs with equipment and facilities valued in excess of $6 million.

MATERIALS FABRICATION & PROCESSING

- Atomic layer deposition (ALD)
- RF/DC sputtering
- Pulsed laser deposition (PLD)
- E-beam evaporation
- Thermal evaporation
- Sol-gel
- Spin coating
- Multicharged ion (MCI) system for ion implantation
- Electron beam lithography (EBL)
- Photolithography
- Rapid thermal processing (RTP)
- Reactive ion etching (RIE)
- Laser micromachining
- Laser surface treatment
- Laser/materials interaction

MATERIALS CHARACTERIZATION

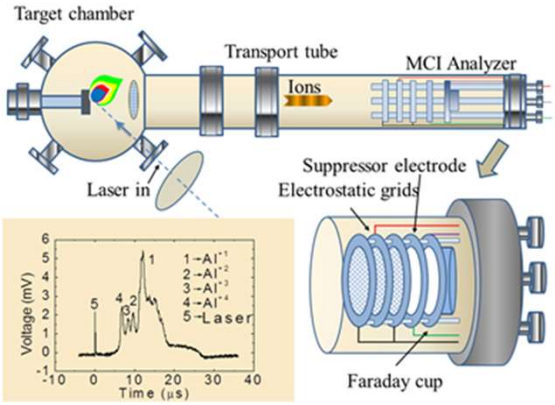
- High resolution transmission electron microscope (HRTEM)
- Scanning electron microscope (SEM)
- Energy dispersive spectroscopy (EDS)
- Atomic force microscope (AFM)
- Scanning tunneling microscope (STM)
- X-ray diffraction (XRD)
- Nanoindentation
- Lifetime fluorescence spectroscopy
- UV-Vis spectroscopy
- Probe station for electrical device testing & semiconductor device analyzer
- Optical microscope
- Time-resolved electron diffraction
- Reflection high-energy electron diffraction (RHEED)

LASERS

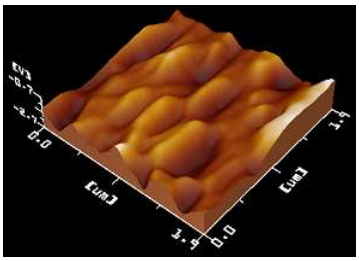
- Femtosecond Ti:sapphire laser
- Q-switched Nd:YAG laser
- Excimer laser

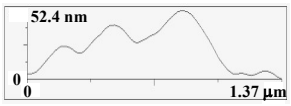
FABRICATION AND ANALYSIS

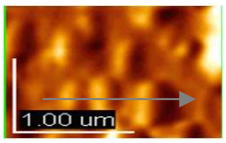
Laser MCI System



InP on GaAs (100) by PLD

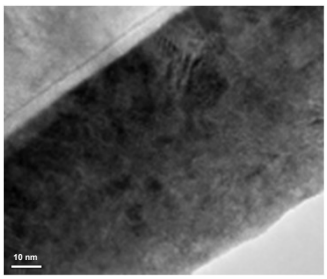




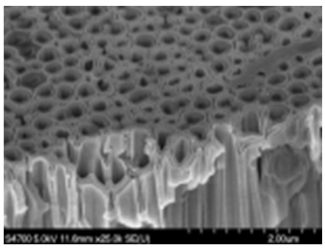


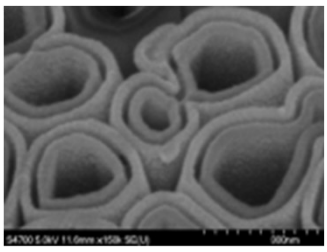
Atomic Layer Deposition (ALD) System

HfO_2 Thin film on Si by ALD



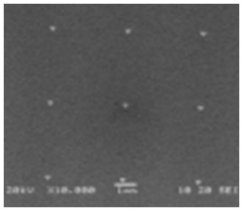
HfO_2 tube-in-tube structure by ALD

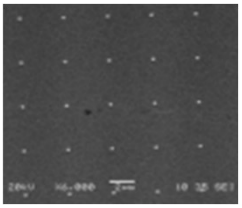




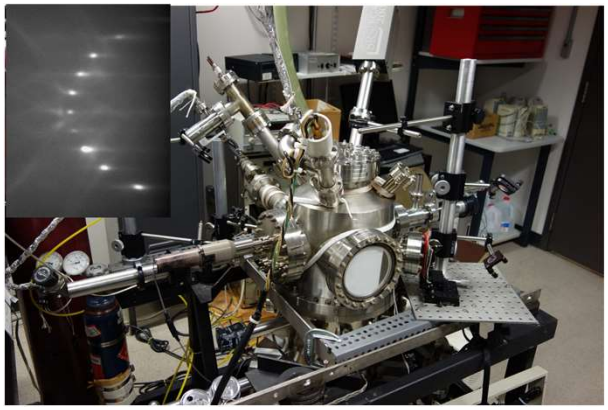
JEOL 6060LV SEM Equipped with Raith EBL System

Ag Nanoparticles by EBL



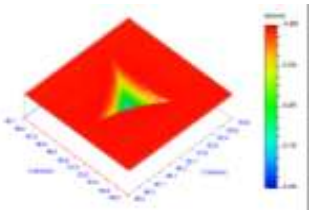


UHV femtosecond laser PLD system with RHEED

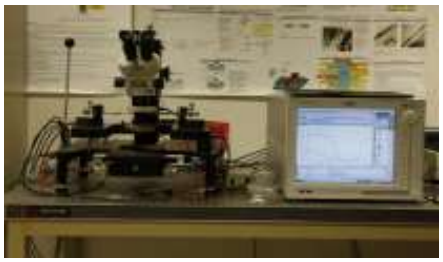


Nano-Indenter XP from MTS

A triangular Berkovich diamond tip impression

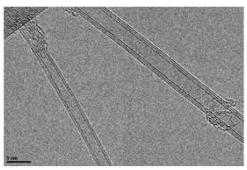


Probe Station and Agilent B1500A Semiconductor Device Analyzer

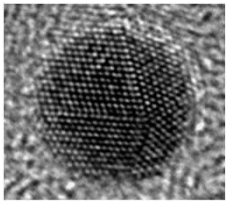


Scanning Probe Microscope (SPM)

BN Nanotubes



Au Nano-particle



JEOL JEM-2100F Field Emission HRTEM

FACULTY

Dr. Hani E. Elsayed-Ali
Professor, Department of Electrical & Computer Engineering,
Director, ODU Applied Research Center

Ultrafast laser-based measurements; laser processing, thin film and nanocrystal fabrication; pulsed laser deposition; semiconductor surface preparation and characterization; electron emitters and electron gun design; and thin film and laser-based sensors

Dr. Helmut Baumgart
Professor, Department of Electrical & Computer Engineering

Nanotechnology; microelectronics fabrication; high-k dielectrics for advanced gate stack engineering; atomic layer deposition (ALD) technology of electronic thin film materials; semiconductor device processing; thin film growth; ALD of ZnO for detector and sensor applications

Dr. Abdelmageed Elmustafa
Professor, Department of Mechanical & Aerospace Engineering

Nanoscale mechanical behavior of materials; nanoindentation (metals, polymers, alloys, interconnects); dislocation and strain gradient plasticity; thin films (mechanical properties and characterization); modeling and simulation (nanoindentation creep and contact mechanics); RF accelerators breakdown

Dr. Sylvain Marsillac
Professor, Department of Electrical & Computer Engineering

Solar cells, new inorganic materials for renewable energy applications, innovative tools for in-situ and real-time analysis, novel architectures and techniques for the fabrication of flexible and high efficiency solar cells, materials characterization

Dr. Gon Namkoong
Professor, Department of Electrical & Computer Engineering

Development of nitride/ZnO-based materials and devices on innovative substrate materials as well as applying new growth techniques to facilitate material and device improvements; development of organic, hybrid organic-inorganic, inorganic solar cells