Technology

Composite Structures and Nano Engineering

The University of Mississippi Composite Structures and Nano Engineering Research Group

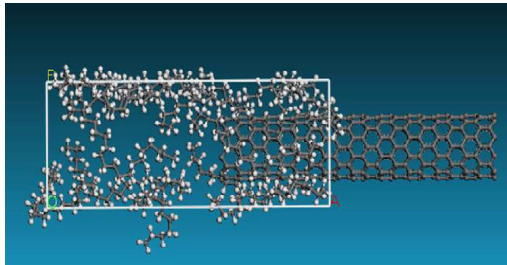## at the University of Mississippi

R&D OPPORTUNITY

The Composite Structures and Nano Engineering Research Group (CSNERG) at the University of Mississippi is focused on utilizing nanoparticle enhanced and other advanced composites for various engineering applications.


INTRODUCTION

CSNERG is dedicated to fostering interdisciplinary research and education in advanced composite materials and structures, with an emphasis on nano composites and their application in infrastructure, mechanical, electrical, chemical and other engineering sectors.

CSNERG has been built on the strengths of the multi-disciplinary members within the Research Group. These strengths include blast survivability and homeland security; composite/hybrid materials and structures; mechanics from nano, micro, on up to macro scales; impact and crash worthiness; electric power and telecommuniations; chemical and biological systems; and simulations/modeling.
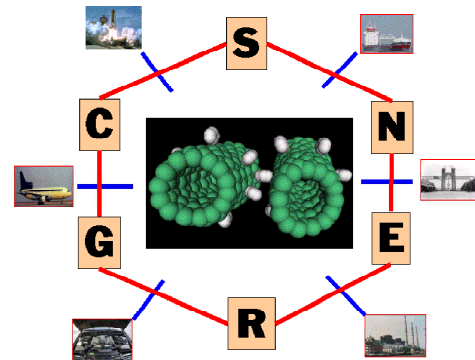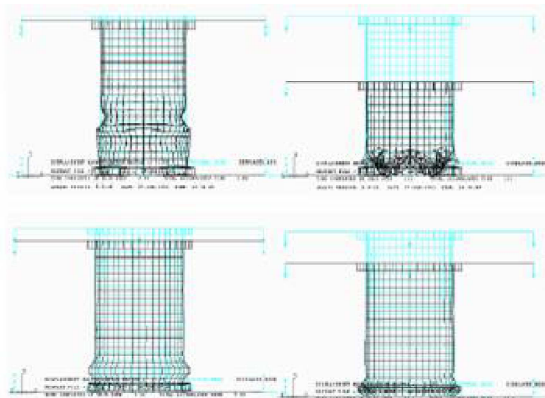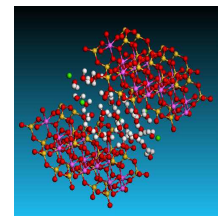

FUNDING

CSNERG was founded in 2004. It has since received funding from the US National Aeronautics and Space Administration (NASA), the Mississippi Space Grant Consortium, the Office of Naval Research, the Air Force Research Labs, the Mississippi Department of Transportation (MDOT) and the Department of Homeland Security (DHS).
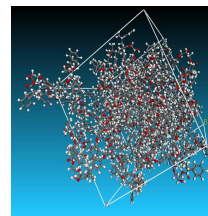
Vinyl ester matrix   Nano-clay reinforcement

Molecular Dynamic Simulations

DEVELOPMENT CAPABILITIES

As a multi-disciplinary group, the researchers at CSNERG have the knowledge, skills and ability to readily design and develop nanoparticle enhanced and other advanced composite systems for civil infrastructure, survivability and homeland security applications.

Through collaborative relationships with researchers at the US Army Corps of Engineers (ERDC), Applied Research Associates (ARA), Ensinger Co., Michigan State University, Wayne State University, University of Illinois Urbana-Champaign, University of New Orleans, North Carolina A & T State University and the University of Rhode Island, CSNERG has the ability to assemble research teams capable of solving problems and designing robust solutions pertaining to civil infrastructure, survivability and homeland security.
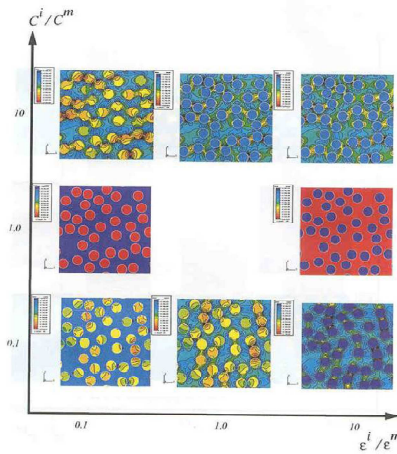
For more information contact:

Prof. Alexander Cheng
Email: acheng@olemiss.edu, Ph. # 662-915-5362
http://www.olemiss.edu/research/csnerg/composite

Technology

Composite Structures and Nano Engineering
The University of Mississippi Composite Structures and Nano Engineering Research Group

at the University of Mississippi

RESEARCH INTEREST AREAS

The primary research interests of scientists with the CSNERG include:

- Impact, blast and crash;
  vibration and dynamic mechanical analysis

- Hybrid and cement/polymer based composites for
  low-cost and high-durability infrastructure applications

- Mechanics of damage under multiple spatial/time scales;
  long-term performance, durability, aging, and
  environmental effects of materials; mechanics of porous
  materials

- Nano mechanics and nano composites: nano, micro,
  meso, macro scales

- Advanced computational simulations and modeling of
  structures, components and systems

- Nano coatings, gas plasma treatment and doping of
  materials to prepare smart surfaces and bio-sensors

- Non-destructuve testing (NDT), and Resonant
  Ultrasound Spectroscopy (RUS)

- Structural health monitoring, repair and rehabilitation
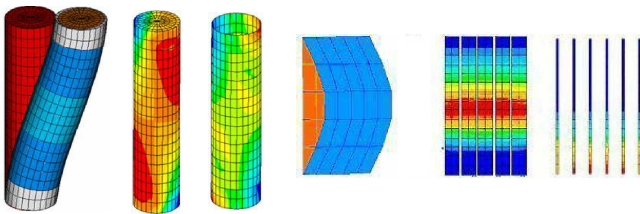
FACILITIES AND RESOURCES

Researchers at the CSNERG have access to resources which include software, hardware and data needed to conduct nano and composite structures research:

Testing Facilities

- HP modal and spectrum analysis equipment for dynamic
  property evaluation
- Dynatup 8250 HV instrumented impact test system with
  temperature chamber
- Transmission and reflective photoelastic experimental
  stress analysis
- TA Instruments Model Q800 Dynamic Mechanical
  Analyzer
- Digital Instruments Nanoscope IIIa Multimode Scanning
  Probe Atomic Force Microscope
- Enduratec Axial/Torsion Smart Test System
- Tenny CAS temperature and humidity controlled
  chamber
- Gamry Electrochemical Impedance Spectroscopy (EIS)
  equipment
- MTS 810 Axial Test System with Environmental Chamber
- Rapid Freeze-Thaw Cabinet

Computational Facilities

- 2-SGI Origin Dual-processors
- 5-SGI Workstations
- FEA softwares: ABAQUS, LS DYNA, ANSYS, AUTODYN
- Other softwares: MEScope Modal Analysis

Mississippi Center for Supercomputing Research (MCSR)

- SGI Origin 2000 64-processor system

CSNERG also has access to ERDC Labs in Vicksburg, MS and to facilities within the School of Engineering which include the Composite Materials Manufacturing and Mechanical Testing facilities.
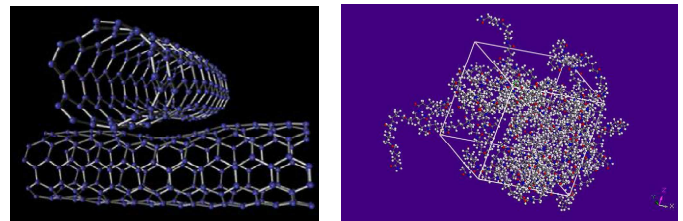
For more information contact Dr. Alexander H.D. Cheng, Professor and Chair, Department of Civil Engineering phone: (662) 915-7191, email: acheng@olemiss.edu