



University of Mississippi

Nano-Particle Reinforced Composites for Critical Infrastructure Protection



Dr. Alexander Cheng, acheng@olemiss.edu, 662-915-5362

Prevent, Protect, Respond, Recover

Homeland Security Challenge:

Protecting the nation's critical infrastructure and key resources against terrorist attacks and natural disasters is vital to national security, homeland security, public safety, economic vitality, and way of life. There is a need to develop efficient, cost effective techniques to strengthen, reinforce, and to retrofit existing structures against blasts, fire, earthquakes and other threats.

Research Project Solution:

Recent developments in nanotechnology and composite materials have potential application to infrastructure protection and the ability to address all hazards. The focus of this project is to create nano-particle reinforced composites for blast and fire protection. The project will provide computational tools for the assessment of building damages with or without retrofitting.

National Implications:

The new material and simulation tools developed in this project can be used to support mitigation plans for protecting critical infrastructures and key resources nationwide. The tools can be used for the purpose of planning and demonstrating evacuation strategies during an emergency event. The nano-particle reinforced composite materials can be used to retrofit government buildings/facilities, bridges, tunnels, pipelines, power and communication transmission and other critical infrastructures. The products of this research will impact preparedness, response, recovery and resilience in the event of terrorist attacks, natural disasters, and other emergencies.



Blast load simulator (BLS) at the U.S. Army Engineer Research and Development Center used to conduct experimental blast tests. The BLS can simulate an approximate threat level of about 27,000 pounds of TNT at 184 feet.



Failure shape obtained experimentally using the BLS for a wall retrofitted with nano-coated material.

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For More Information on SERRI, contact;

Warren Edwards, Director, SERRI
865-574-8277, edwardswc@ornl.gov

Ben Thomas, Operations Manager
865-574-5438, thomasbjr@ornl.gov

SERRI is managed by the Department of Energy's Oak Ridge National Laboratory for the U.S. Department of Homeland Security