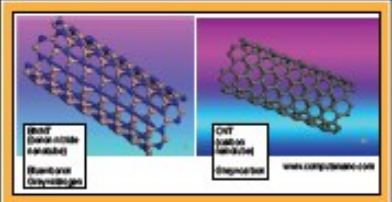
National Aeronautics and Space Administration

Boron Nitride Nanotubes (BNNT)

In collaboration with Jefferson Lab and National Institute of Aerospace



BNNT properties:

- Strength-to-weight ratio and stiffness: > 95% of CNT, ~100x metals
- Service temperature: Double CNT limit in air (800°C+)
- Bond interface better than CNT: promotes tube-to-tube bonding
- Piezoelectric Constant: (0.25–0.4 C/m2) Higher than piezopolymers.
- High temperature electrical insulator
- Thermal Conduction: Higher than metal, based on h-BN value of 600 W/mK
- Radiation shielding: excellent neutron attenuator
- White color: transparent in visible ranges

Synthesis
Characterization
Processing/
Manufacturing

Potential Applications

- Dramatic reduction in structural mass (2x to 6X over baseline materials)
- Combustion path optimization and thermal protection system (TPS) (800°C)
- Enables design solutions to space radiation shielding challenges
- Self-sensing structures for IVHM (Sensors for load, strain, shear, pressure, and temperature
- Multifunctional structures (active noise cancellation, vibration damping)
- Flexible photovoltaics & electronics
- High or low temperature lubricants
- Thermal management of space vehicles and spacesuits with high thermal conductivity and high temperature capability
- Lightweight Armor for body and vehicles and high temperature wear resistance materials

Collaborations

- National Institute of Aerospace
- Jefferson Lab
- Glenn Research Center
- AFOSR
- UC-Berkeley
- DARPA

GRC: Propulsion Components

- Reduced weight of engine components
- Multifunctionality of high temperature static structures (e.g., load bearing+ acoustics, load bearing + thermal management)
- Increased strength and durability at high temperature

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