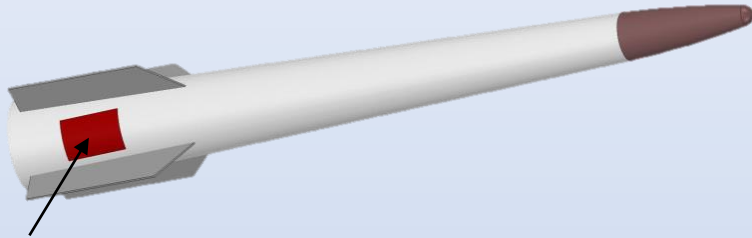


Cerablak™ Technology

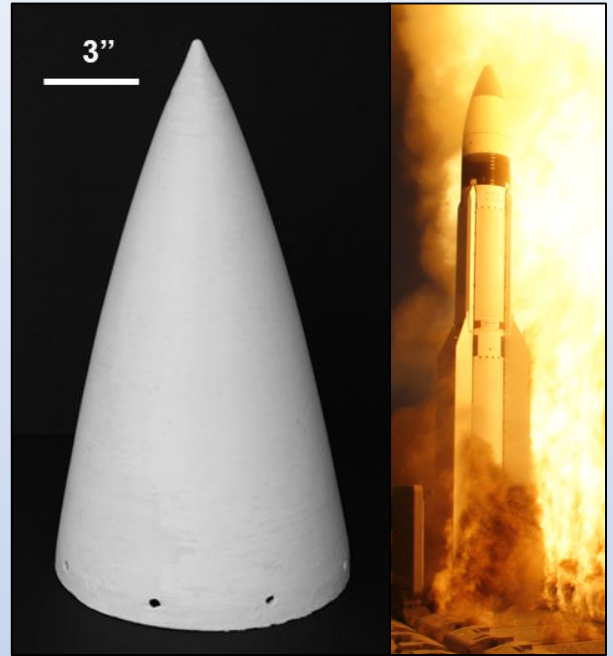
Driving a Paradigm Shift in High Temperature Materials and Coatings

Thermal Protection Systems for Hypersonics: Mach 5+



Hypervelocity
Projectile Concept
with Cerablak™
CMC TPS RF
Window (NAVSEA
Phase II SBIR)

Cerablak™ CMC
Missile Radome
Prototype for
AARGM
(NAVAIR/ONR
BAA)



Oxide-Oxide Ceramic Matrix Composite (Ox-Ox CMC)

TPS/RF Window Material of Choice for a Broad Range of Hypersonic Missiles, Projectiles, & Vehicles

Cerablak™ CMCs for Extreme Environments

ATFI's flagship high performance Ox-Ox CMC product

- Enables precision guidance from launch through terminal phase
- Demonstrated electrical & thermo-structural performance in simulated hypersonic environment
- Superior matrix technology enhances reliability, performance, & durability
- Incorporates unique surface engineering for superior performance
- Versatile & affordable manufacturing



Severe Aerothermal
Loads at Mach 5 +

Applied Thin Films, Inc. (ATFI)
8261 Elmwood Avenue
Skokie, IL 60077.847.807.4077
www.atfinet.com sales@atfinet.com



ATFI is a Global Leader in Advanced Ceramic Materials & Coatings

Defense • Aerospace • Energy

OUR MISSION

To offer our customers high value, disruptive, innovative materials technologies for sustained competitive advantage

Company History

Spinoff from Northwestern University with 19 years in operation & more than \$30 million of investment to date

Products & Services

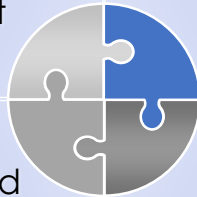
Product portfolio under the Cerablak™ Technology platform offering high value & extraordinary advancements

Cerablak™ Technology

A nanoscale-engineered high temperature material innovation bringing disruptive solutions for defense & aerospace

Secured IP

More than 25 US & international patents awarded with additional patents pending & sustained innovation



Headquartered in a 22,000 ft² R&D & Material Prototyping Facility in Skokie, IL

Supported via sponsored programs from NAVSEA, NAVAIR, USAF, NASA, MDA

Based on the Cerablak™ Technology platform, ATFI has developed revolutionary advanced material products for extreme service environments

High Performance Cerablak™ CMCs

- Best in class RF & thermostructural properties for radomes, RF windows, & thermal protection systems in demanding environments

Cerablak® HTP 100 Series High E Coatings

- Unique combination of ultra high emissivity, high temperature capability, chemical inertness, & UHV stability

Spray on Thermal Barrier Coatings (SOTBC)

- Easy to apply ceramic coatings for metals, ceramics, & composites
- Outstanding high-temperature thermal barrier performance



ATFI has received numerous SBIR awards, including Phase III SBIR awards, from NAVSEA, USAF, NAVAIR, & Others

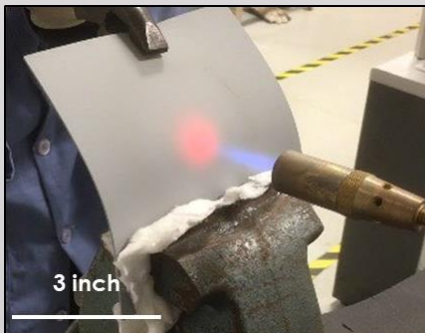
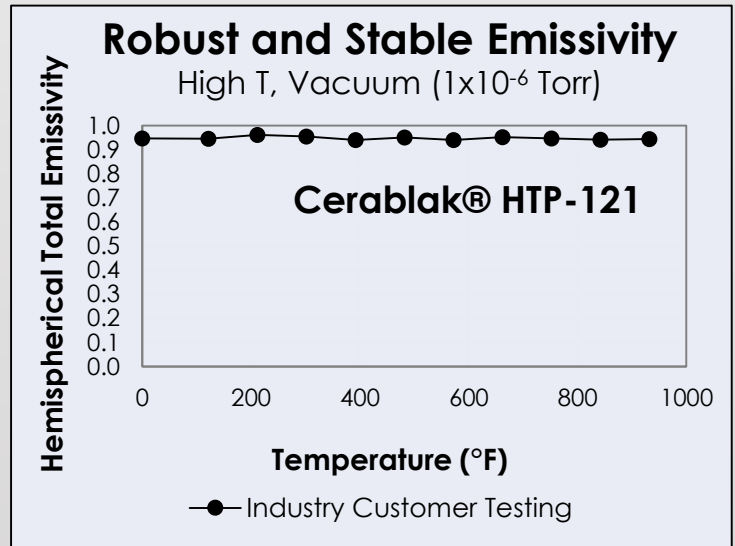
Introducing Cerablak® HTP 121

an easy to apply spray-on high emissivity ceramic paint

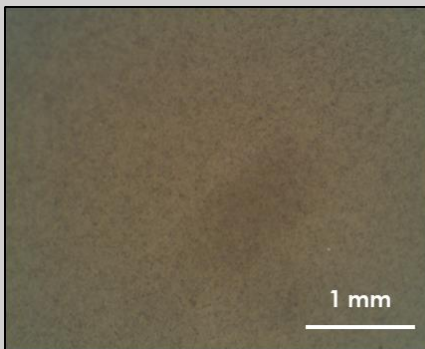
- Excellent adhesion to metals & alloys with outstanding oxidation protection
- Robust, tough, & abrasion resistant with engineered nanoscale porosity
- Extensively tested & validated by industry OEMs

An Ideal Protective Coating for Hypersonic Vehicles & Missiles with Unmatched Performance to Block Radiant Heat, > 2000°F Capability

Cerablak® HTP 121 Properties	
Emissivity (ϵ)	> 0.93
Coating Color	Gray
Maximum Use Temperature (°F)	3000
Suggested Thickness (mils)	0.5-3
Cured Coating Density (g/cc)	2-2.7



High Temperature bend testing of Cerablak® HTP 121 on Inconel 617 @ 1922°F



Optical micrograph showing no cracking after hot bend test 0.6% strain.

ALL-IN-ONE CERAMIC COATING FOR RADIATIVE THERMAL MANAGEMENT IN DEMANDING SERVICE ENVIRONMENTS

