119284 - Insensitive Electric Priming And Fusing Ignition Method Using Aluminum Nitride/Tungsten Trace Heaters

By:

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&

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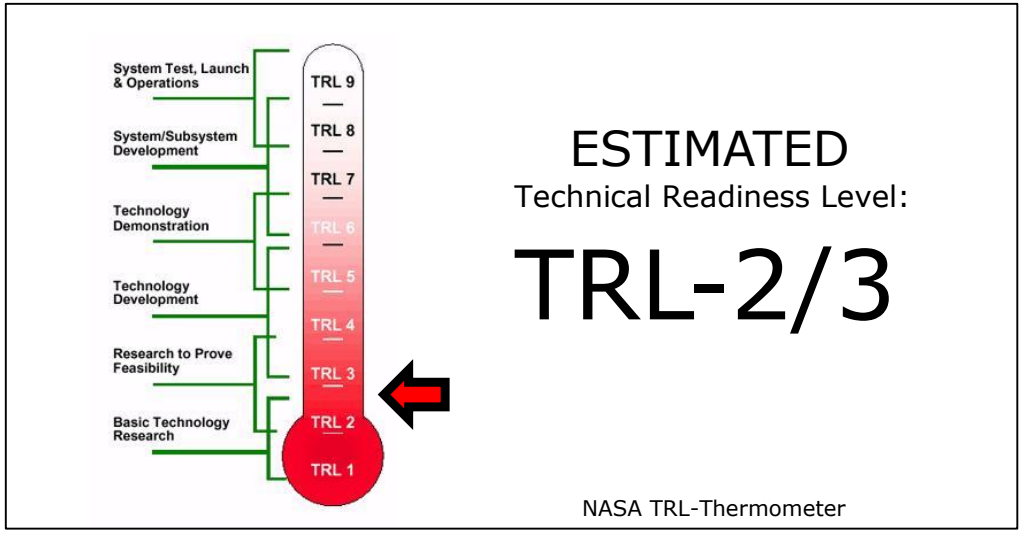


The Purpose Of This Presentation Is To Introduce A Concept In The Pre-Design Phase With The Potential To Solve Problems Encountered In The Process Of Removing Lead From Priming And Ignition Systems, Eliminating Changes In Sensitivity With Aging And Enabling Metal Oxide Priming Ignition.

We Are Seeking Partners With Experience In The Priming And Ignition Area Who Would Be Interested In Research To Prove The Feasibility Of The Devices And Further Development Of The Technology For Defense Products.

Contents:

Introduction:

The Following Is A Presentation Of An Alternative Ignition System Which Is Electrically Initiated And Capable Of Generating Molten Tungsten Jets At >3,600F That Can Ignite Gunpowder, Booster Pellets And Metal Oxides.

The Technology Is Currently Used For Commercial And Consumer Products, With Millions Of Units Produced As Advanced Heaters…Particularly In Applications Needing Rapid Heating And Precise Temperature Control.

In This Case, We Examine The Potential Of Designed-In Overvoltage Which Cause The Non-Explosive Containing Primer To Burst…Scattering White Hot Fragments Of Aluminum Nitride And Creating The Tungsten Plasma Jet.

Introduction To Aluminum Nitride (AlN) Heater Technology:

Can We Have Non-Explosive Primers And Igniters With The Speed And Reliability Of A Light Bulb?

Expanding “Element” Gas Gently Explodes The Light Bulb…What If We Focus It? Compress It? Get It White Hot And Then Blow Up The “Container”?

Gluhlampe Explodiat Photo

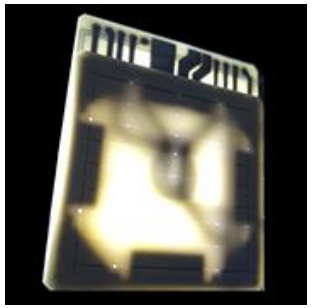
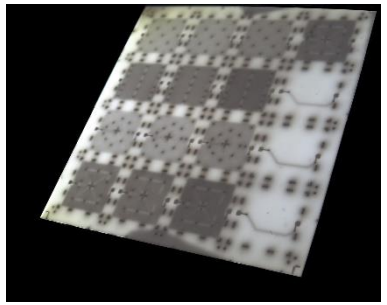
Advanced Heater Technology From OASIS Materials:

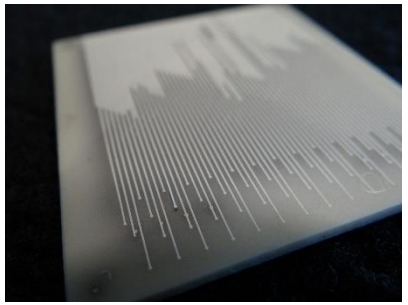
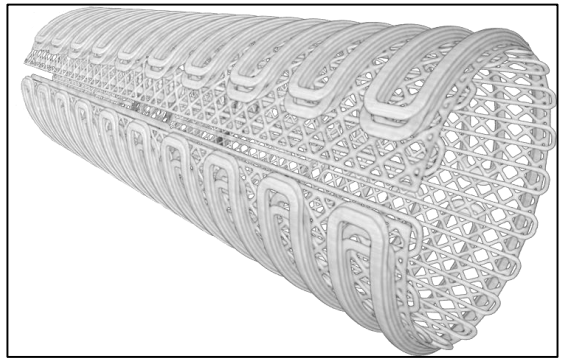
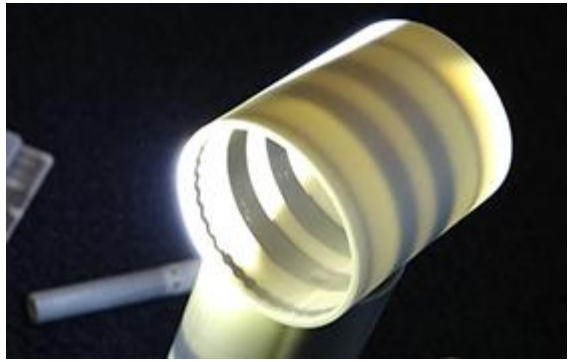
Aluminum Nitride Substrates And Tungsten Heating Element Traces

OASIS Materials Heaters Are Used In IC Fabrication & Materials Processing,
As Well As In Consumer, Commercial & Industrial Thermal Devices.

OASIS Materials AlN Heaters:

Many Shapes And Sizes Of Advanced Heaters Enable Adaptation To Ignition Devices


"Blades", Tubes, Cups, Rods, Pointed Probes And Intricate Flat Electric Heaters

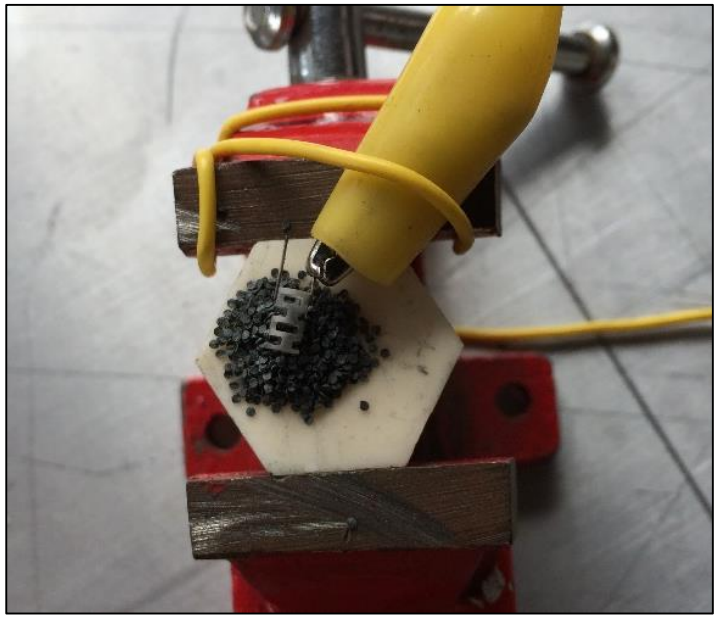
OASIS Materials Aluminum Nitride & Tungsten Trace Heater:

2,000 Degrees C = 3,632 Degrees F

AlN Heater Technology For “Design Voltage” Ignition:

Igniting Gunpowder With High Performance AlN Heater:

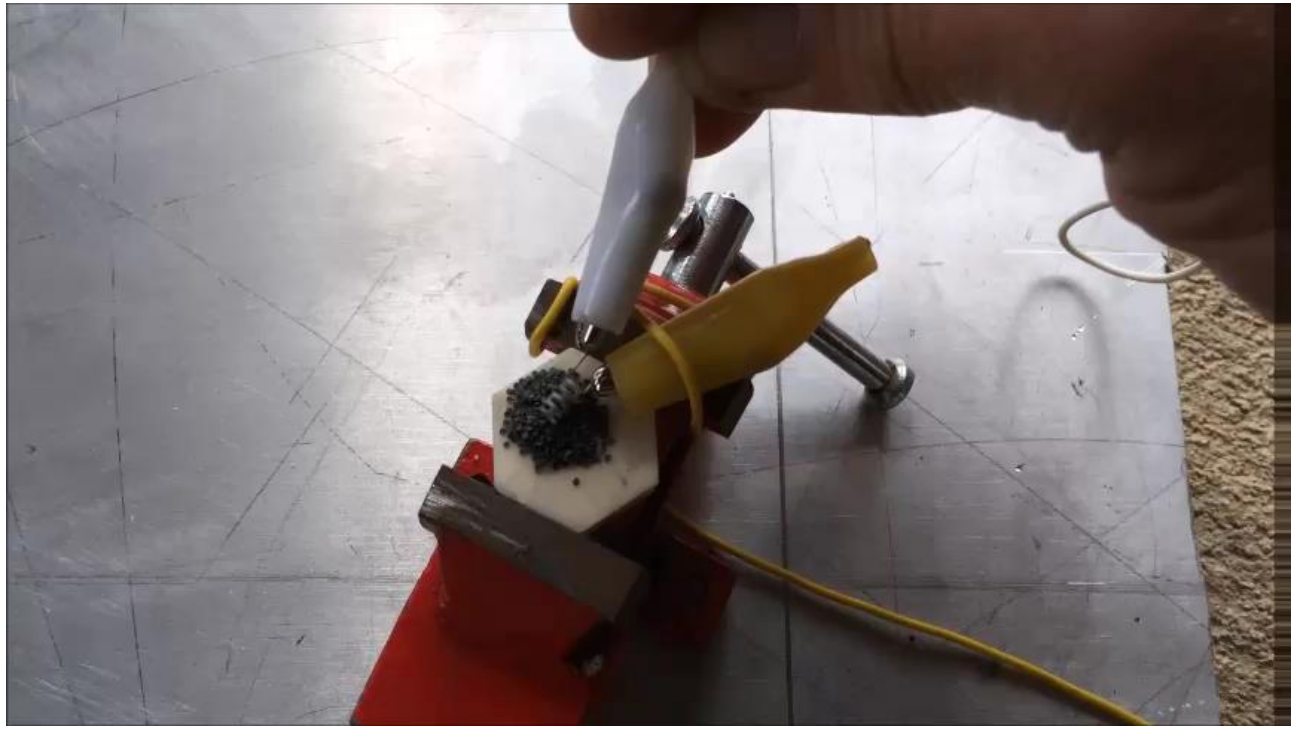
Rimfire Gunpowder Ignited By Cylindrical AlN Heater In Close Proximity



3.2v Rated AlN Heater, 9v DC Transistor Battery, Federal (GD-SMPD) .22LR Rimfire Propellant, Estimated Temperature Rise >300F In Less Than One Second

Igniting Gunpowder With High Performance AlN Heater:

Demonstrating Rapid Heating Design Use Of “Million Cycle” Heating Capability

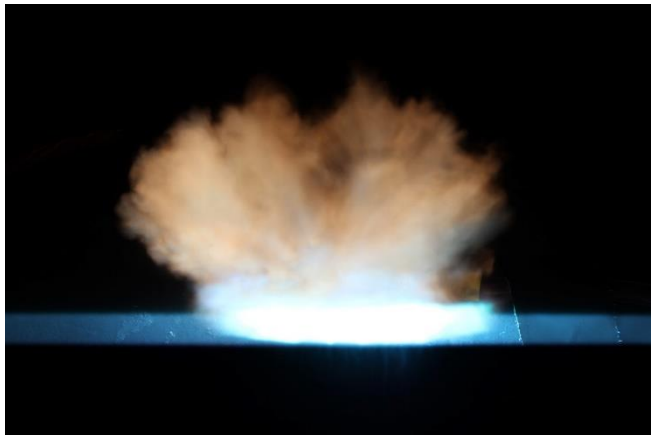


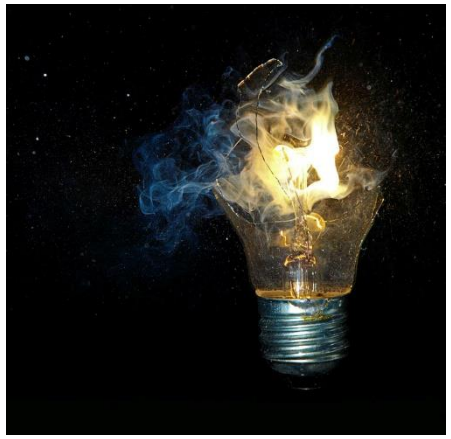
Video Demonstrating >200C Temperature Change Per Second Without Overvoltage

AlN Heater Technology For “Overvoltage” Ignition:

The General Idea: Instantaneous Tungsten Vaporization

AlN Heaters Contain Tungsten Traces Which Are Highly Compressed & Contained



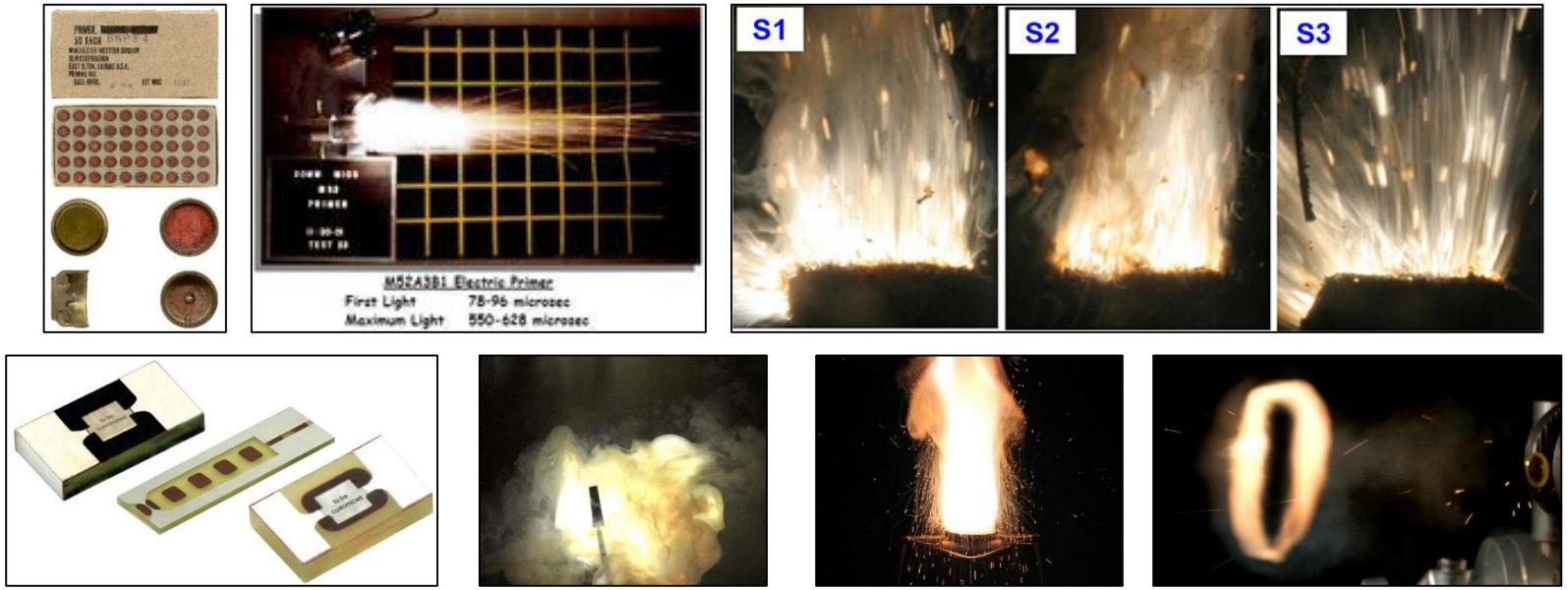


Unlike The Gentle Bursting Of A Light Bulb Or The Puff Of Arcing Wires, AlN Heaters Can Be Made To Instantly And Violently Explode On Overvoltage.

Project SIGMA Photos (L & R), Exploding Light Bulb Pinterest

Advancing Metal Oxide Priming Ignition By AlN Heater Blast:

Replacing These Traditional Bridge Wire & Explosive Types With Vaporized Tungsten Jets



Clockwise From Upper Left: Winchester Bridge Wire Electric Primers, WP-1183 SERD Photo, InTech Nano-Thermite, YouTube Primer Exploding, CyberChemist Photo, Davey & Bickford Igniter Photo, Vishay MEPIC

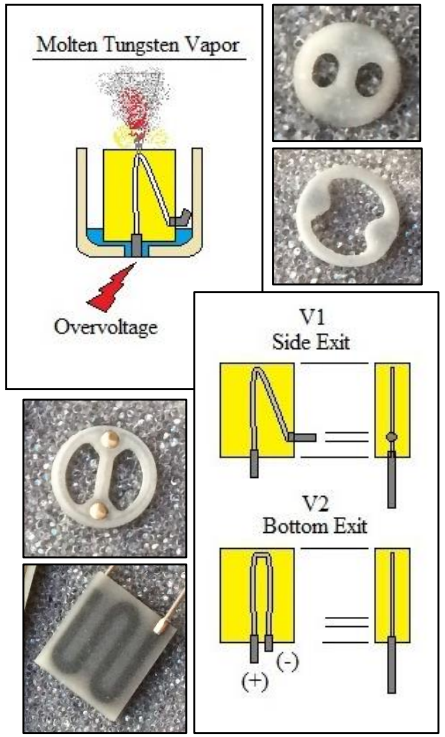
https://www.serdp-estcp.org/Program-Areas/Weapons-Systems-and-Platforms/Energetic-Materials-and-Munitions/Ammunition-and-Projectiles/WP-1183

Some Concepts Of AlN Heater Overvoltage Ignition:

Proposed Features & Benefits Of Overvoltage Bursting AlN Heaters:

* Tungsten Element Is Sealed In An AlN Sandwich…

* No Chemical Explosive To Age Or Deteriorate…



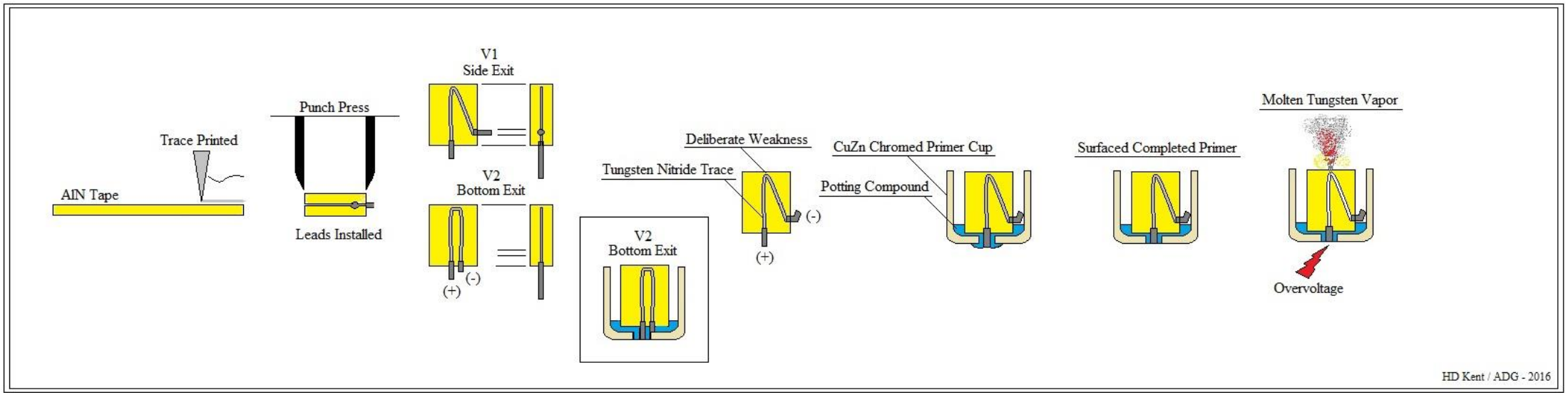
* Tungsten Element May Be 2-D Printed In Any Configuration…

* Multiple AlN Layers May Be Fired In Any Desired Shape…

Main OASIS AlN Heater Benefits Are Consistency Over Time & "Lightbulb-Like" Reliability… Particularly As An Igniter For Nano-Thermites Or Explosives In Initiators Or Electric Primers

The OASIS Process Of AlN Based Primer Construction:

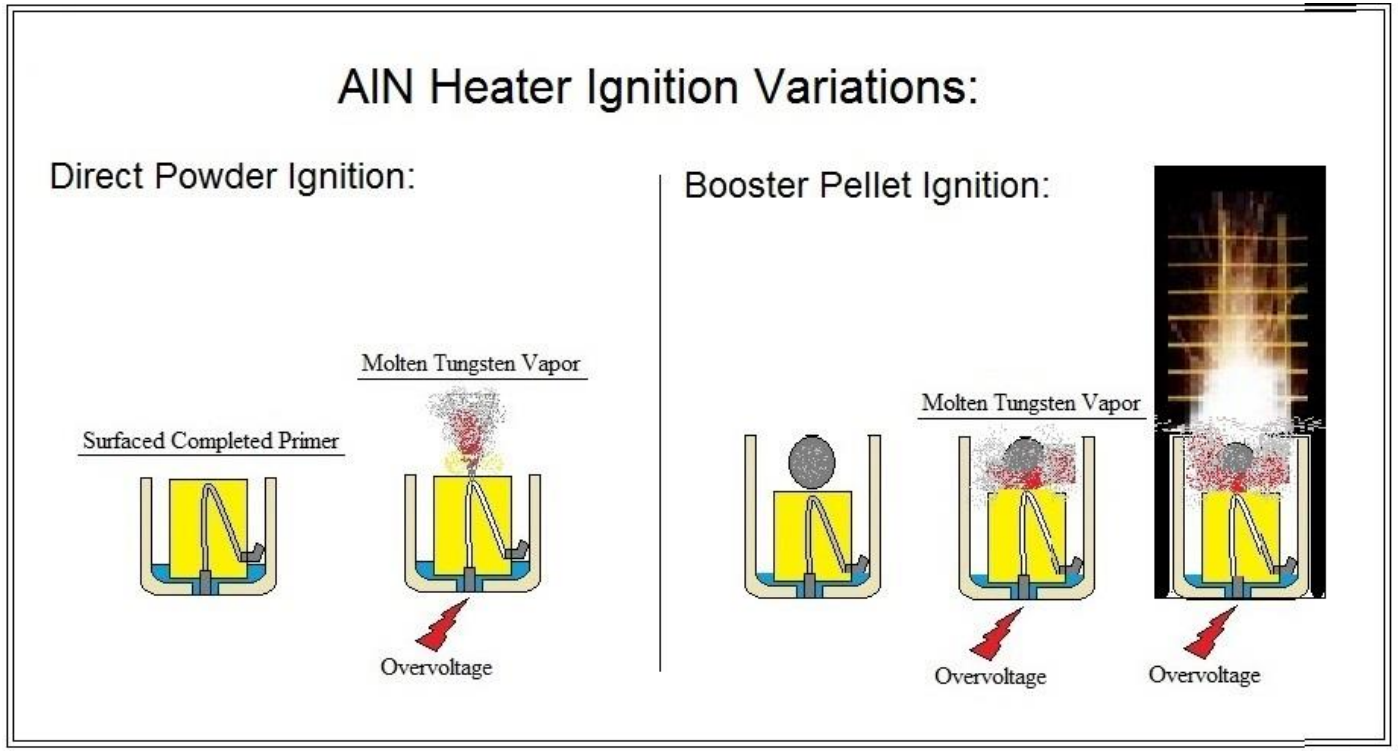
Robotic Processing And Ceramic Firing Of Heater Designs Assures Consistency



OASIS Aluminum Nitride (AlN) Ceramic Tape Is 2-D Printed With Tungsten Heater Trace Lines, Sandwiched With Additional AlN, Have Conductor Leads Installed, Are Outline Punched And Then Fired In High Vacuum/High Temperature Furnaces.

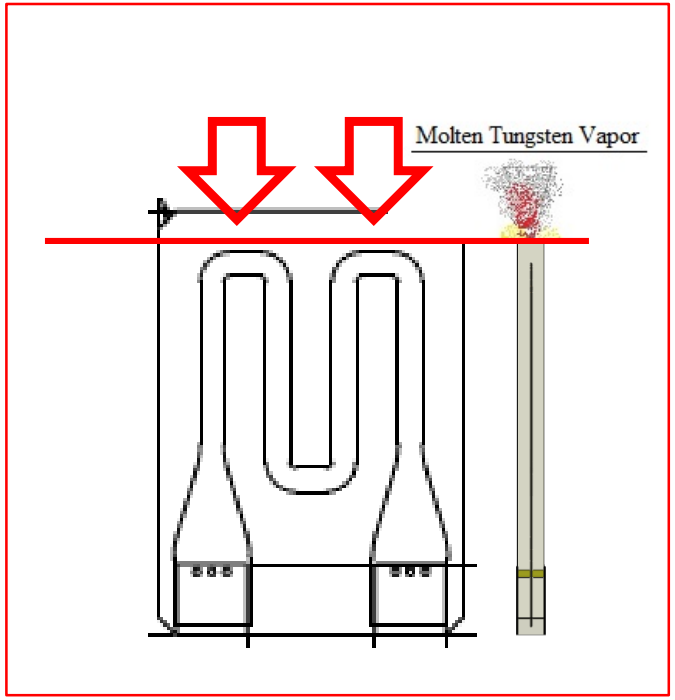
AlN Heater Tungsten Jet In Direct & Boosted Ignition:

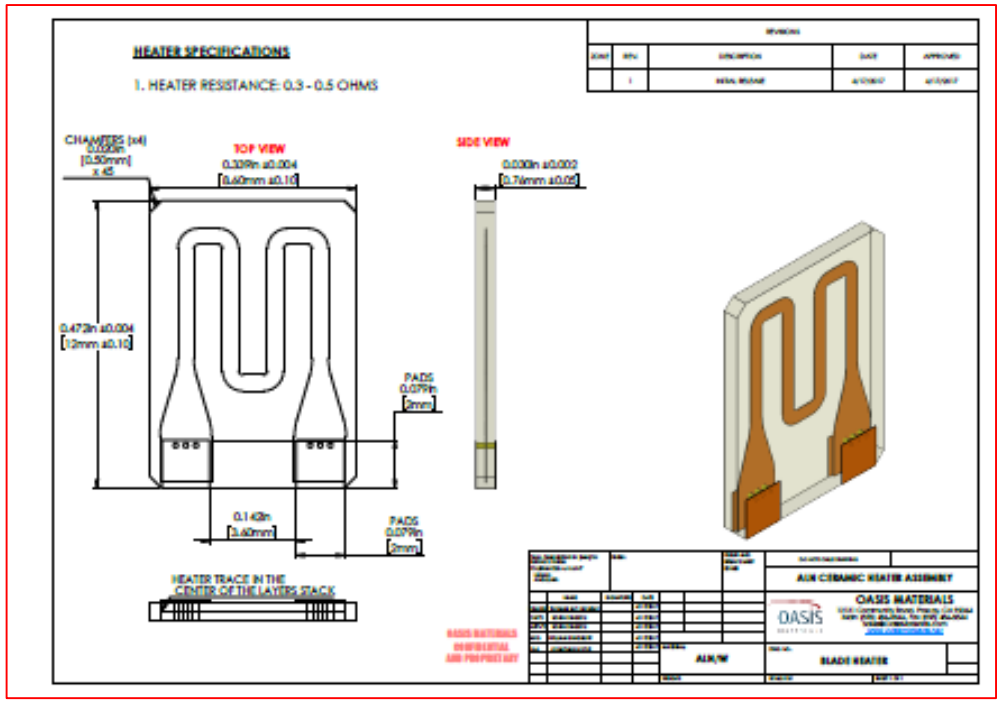
We Witnessed Loose Powder Ignition Without Overvoltage…Now Imagine Far Greater Force



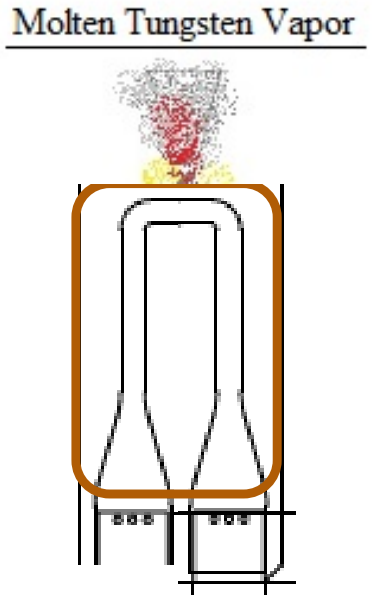
Deliberate Weakness Channels The Tungsten Trace Gas Jet:

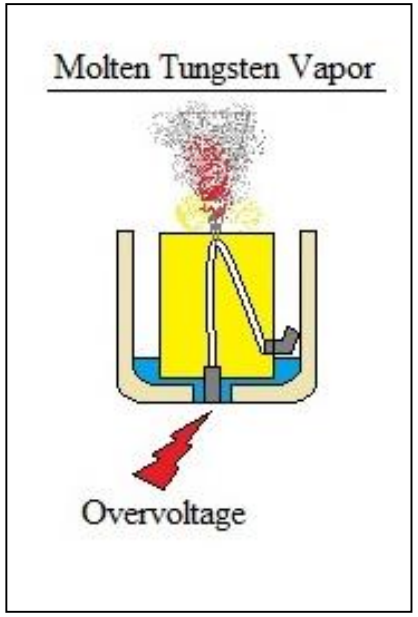
By Thinning Desired Exit Point Or Points In The Design Of The AlN Heater

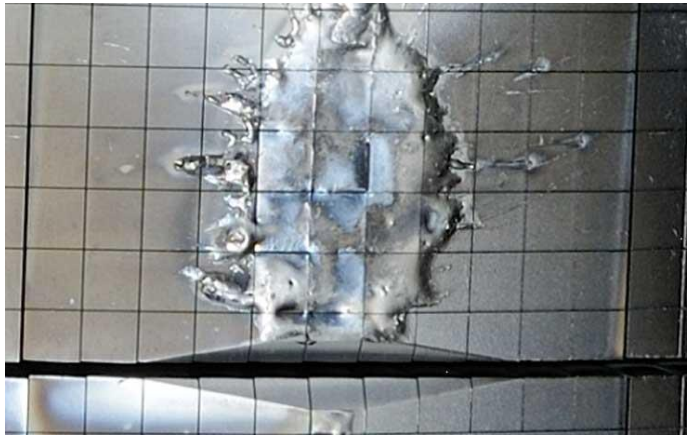




Deliberate Overvoltage Vaporizes The Tungsten Trace:







EuroFusion Molten Tungsten Spray

"Tungsten Has The Highest Melting Point Of All The Elements Discovered, Melting At 3,422 °C, 6,192 °F"

Pressure Buildup Inside Heater Yields High Speed Tungsten Jet…And Hot AlN Fragments

AlN Heaters For Unleaded & Metal Oxide Ignition:

AlN Heater Overvoltage May Enable Consistent SHS Ignition:

Tungsten Gas Jet Potential For Self-Propagating High-Temperature Synthesis

Nano-Scale Thermites Introduction

Research into **nanothermites** is a current hot topic in the field of energetic materials. Energetic materials are a class of materials containing both fuel and oxidizer in a mixture or within a single compound, and include all the broad areas of propellants, explosives and pyrotechnics. For thermite-type reactions, a metal oxide is the oxidizer, and aluminum the fuel. Thermite-type reactions (as illustrated in Equation 1) on the nanoscale have been called many names including nanothermites [1-3] metastable intermolecular composites (MICs) [1, 4, 5] or superthermites [6].

The phrase **"nanothermites**" comes from the particle sizes used in these energetic mixtures, in contrast to the more familiar thermite type reaction in which the particle sizes are in the order of microns. The term "metastable intermolecular composites" comes from the fact that the 116 ***mixtures of metal oxide and aluminum are stable up to their ignition temperature, at which point self-propagating high-temperature synthesis (SHS) occurs and the thermodynamic products of a metal and aluminum oxide are produced***. Finally, the term "**superthermite**" comes from the fact that thermites composed of nano-sized materials exhibit very different combustion characteristics when compared to those mixed with micron-sized precursors.

Superior combustion velocities, and explosive behavior compared to the usual observed deflagration often characterize thermites made with nanoscale precursors.

D.G. Piercey, T.M. Klapötke

http://www.ipo.waw.pl/wydawnictwa/cejem/2-2010/full/Klapotke.pdf

Applicable Electric & Metal Oxide Priming Experiments:

Hot Fragments Of AlN And Tungsten Gas Jets Can Solve Many Problems…

Various Problems Previously Experienced With Ignition Delays, Failure To Produce Hot Gases, Inconsistent Accuracy & Absence Of Lead As A Lubricant During Passage Of The Round Through The Barrel. Proposed Solution Produces BOTH Hot Tungsten Gases And Fragments And Will Ignite Propellant Booster Pellets As Well As Metal Oxide Priming.

USN Metallic Foil Vaporization Primer, 2003
http://www.google.com/patents/US6910420

Environmentally Acceptable 25mm Cannon Percussion Primer, 2008
http://www.dtic.mil/dtic/tr/fulltext/u2/a482173.pdf

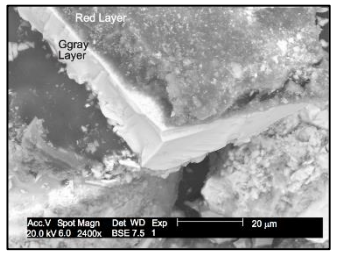
Layered Thermite Metal Oxide Priming Patent, 2016
http://www.google.com/patents/US20160102030

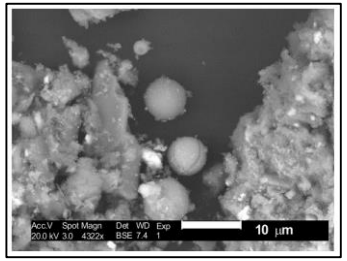
In Addition, We Are Involved Solutions For The Absence Of Lead Using Barrel & Bullet Treatment With ***RF85*** Nano-Calcium Surface Penetrating Coatings For Lubricity:

Thomas E. Steffner | Founder | Better Than New, LLC
Direct: 423-825-7150 URL: http://rf85.com/

U.S. Government Metal Oxide Priming Experimentation:

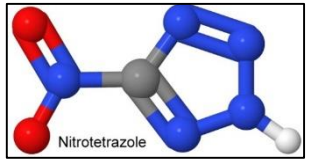
At the **US Naval Air Warfare Center in China Lake, California**, work is underway on electrically ignited primers. A mix of aluminum nanoparticles, and carbon black, with molybdenum trioxide as an oxidizer, is electrically conductive due to the first two ingredients. The goal is ignition within four milliseconds of the current being switched on. Called *nano-thermites*, these combinations of aluminum powder and oxides of less-reactive metals such as iron, copper, or molybdenum, are blended together so that the aluminum and the metal oxide are joined together in particles smaller than 100 nanometers. This leads to very fast reaction times.

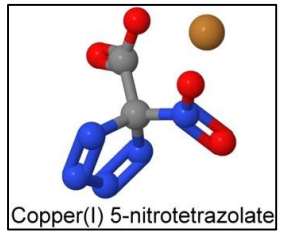




The **US Naval Surface Warfare Center, in Indian Head, Maryland**, is also working with nano-thermites. Called metastable intermolecular composites (MICs), or metastable nanoenergetic composites (MNCs), the names refer to the fact that they are stable as aluminum and metal oxide, but can flip to aluminum oxide and elemental metal (releasing a *lot* of heat — thermite is used to melt steel). In their testing, they are using bismuth oxide, Bi_2O_3 as the metal oxide. It is being considered for all small and medium caliber ammunition, up to calibers of 40 millimeters.

At the **High Explosives Science and Technology Group, in Los Alamos, New Mexico**, chemist My Hang Huynh has been working with modifications of nitrotetrazole and its salts as a primer candidate. The resulting primer is insensitive when wet, an advantage from a safety point of view. Copper salts of the acid are environmentally benign. Potassium, rubidium, and cesium salts also work, but do not meet the criterion of heat stability, as they decompose before the 200° Celsius limit.





http://scitoys.com/eco_friendly_explosives.html

Conclusions, Recommendations, Credits & Addenda:

Conclusions:

- The AlN Heaters Have Demonstrated Rapid Gunpowder Ignition Without Overvoltage
- OASIS Has Dozens Of Explosive Overvoltage Tests Producing Molten Tungsten Jets
- Refinements In Design Can Yield Larger Molten Tungsten Jets And Faster Bursting
- The AlN Heater Can Vaporize Organic Hot Gas Producing Compounds Before Bursting
- A Molten Tungsten Jet Has The Potential To Ignite Nano-Thermite SHS Efficiently
- Development Could Lead To Long Storage Life-Lead Free Metal Oxide Electric Primers
- These Primers Would Be Environmentally And Penetrating Lubricant Insensitive

Recommendations:

- Develop AlN Heater Overvoltage Ignition For Extended Service Life Of Munitions
- Use AlN Heaters To Solve Previous Problems Experienced In Lead-Free Electric Priming
- Explore Potential To Eliminate Environmental And Chemical Primer Sensitivity With Hermetically Sealed, Explosive Free Molten Tungsten Jet Producing AlN Heaters
- Combine AlN Technology With Electrically Fired Nano-Metal Oxide Priming Research
- Contact OASIS Materials LLC For Further Information Or To Discuss Development…

How To Get In Touch With Oasis Materials Company:

OASIS Is Located Near San Diego In Southern California

Oasis Materials Company LP
12131 Community Rd # D,
Poway, CA 92064
Phone: (858) 486-8846

URL: www.oasismaterials.com

Manufacturers Of Award Winning Advanced Aluminum Nitride Heaters,

And Now Proposing Igniters For Fuzes, Initiators & Electric Primers…

Credits:

POC: Howard D. Kent, CEO, Phone: 818-314-8636, e-Mail: HDKent@socal.rr.com

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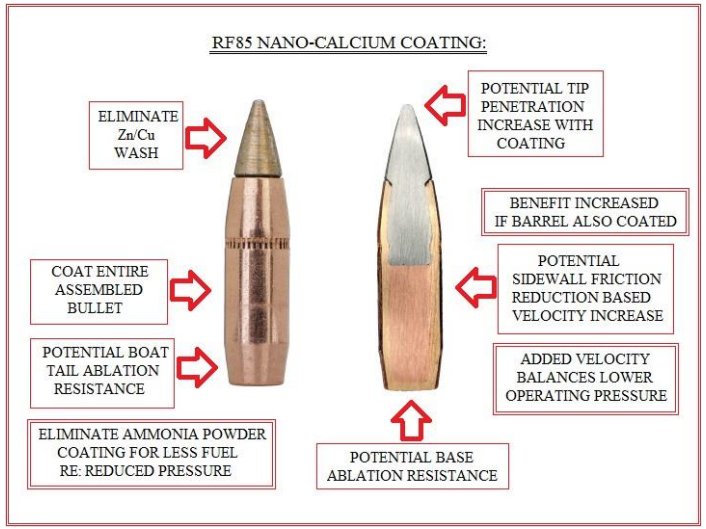
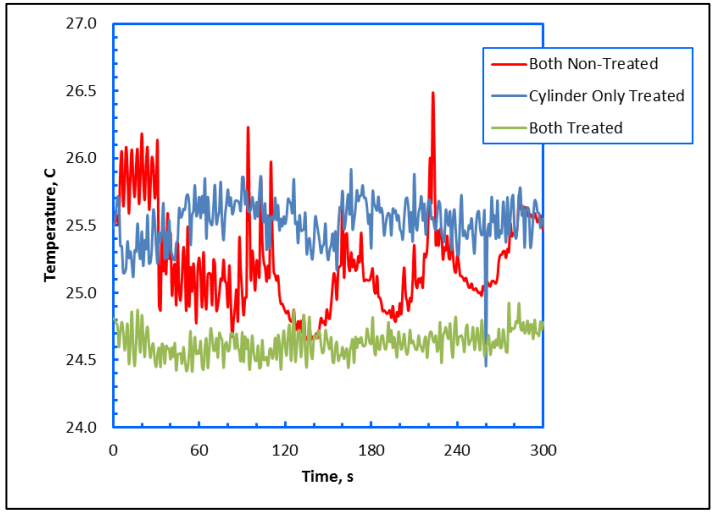
&

POC: Stephen Nootens, VP, Phone: (858) 486-8846, e-Mail: SNootens@oasismaterials.com

Addressing The Missing Lead Issue In Priming:

By Treating Both The Barrel And Bullets With Penetrative Nano-Particulate Coatings





RF85 Licensees **True Velocity Ammunition** & **Andersen Manufacturing** Claim Friction (Resulting Temperature Above) Reduction, Velocity Increase, No Plating, No Weapon Lubrication Required, Nano-Scale Metal Pore Penetrating Calcium Compound Treatment Applied To All Firearm Parts And Bullets On The Production Line. Eliminates Need For Solvents, Cleans Up With Soap And Water, High Corrosion Resistance, Increased Surface Smoothness & 6nm Penetration Depth "Case Hardening" vs. 2-3nm With Salt Bath Nitride.

POC: Thomas E. Steffner | Founder | Better Than New, LLC
Direct: 423-825-7150 URL: http://rf85.com/