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NANOSHEL®
Creating Miracles in Black

Product Catalogue

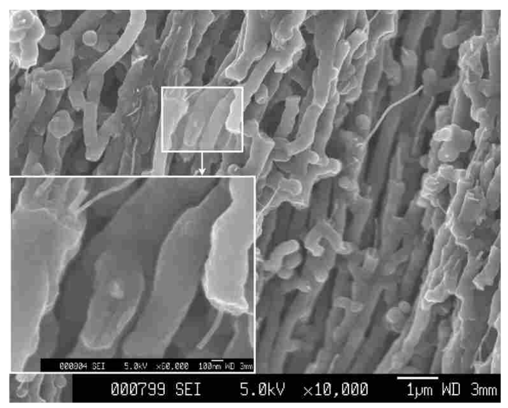
New Era of Nano Applications....!

Nano Innovative Materials
Shape Memory Polymer

Shape memory polymers are polymers whose qualities have been altered to give them dynamic shape "memory" properties. Using thermal stimuli, shape memory polymers can exhibit a radical change from a rigid polymer to a very elastic state, then back to a rigid state again. In its elastic state, it will recover its "memory" shape if left unrestrained. However, while pliable it can be stretched, folded, or otherwise conformed to other shapes, tolerating up to 200% elongation.

Activation methods for thermally responsive SMP

- Resistive heating
- Embedded heaters (for example, stretchy heaters, nichrome wires)
- Contact heating (MRE heaters)
- Induction heating
- Dielectric heating
- Microwave heating
- Infrared radiant heating



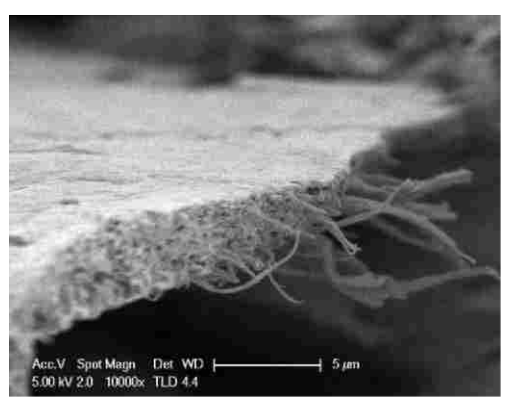
Some of these methods may be enabled by fillers such as:
conductive fillers, CNT, CNF, iron and ferrite.

Benefits

- Toughness
- Unique shape memory properties
- Recovery to memorized shape after repeated deformation
- Ability to change from a rigid polymer to rubbery elastomer
- Over 95% (one-part resin) and 100% (two-part resin) elongation possib in elastic state
- Low viscosity for easy processing (RTM or VARTM) (two-part resin)
- Open-mold curable
- Aesthetic clarity
- Machinability once cured

Applications

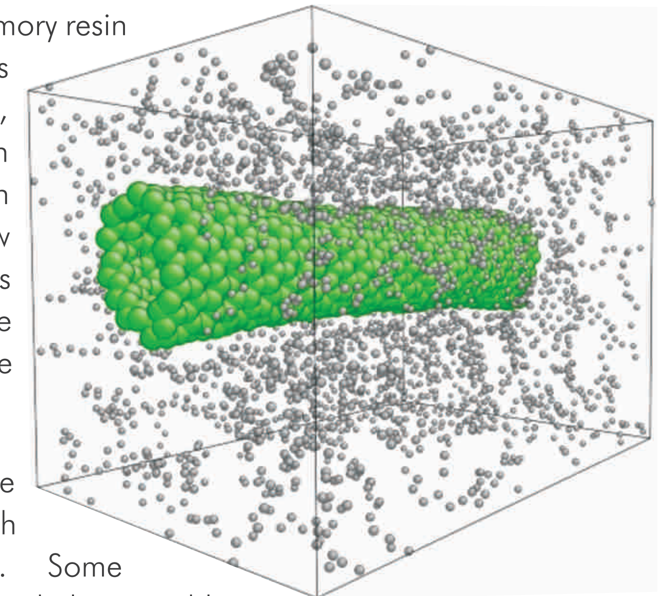
- Customized, reusable molds
- Deployable mechanisms and structures
- Adjustable furniture



NANOSHEL Creating Miracles in Black

Nano Innovative Materials
Shape Memory Polymer Composite

SMP composites capitalize on the ability of the shape memory resin to quickly soften and harden repeatedly. Because of this property, the composites can be temporarily softened, reshaped, and rapidly hardened to function as structures in a variety of configurations. They can be fabricated with nearly any fiber type, and creative reinforcements allow dramatic shape changes in functional structures. SMP is also machinable. Some possible applications include rapid manufacturing, dynamic structures, composite patching, and adaptable reinforcement.



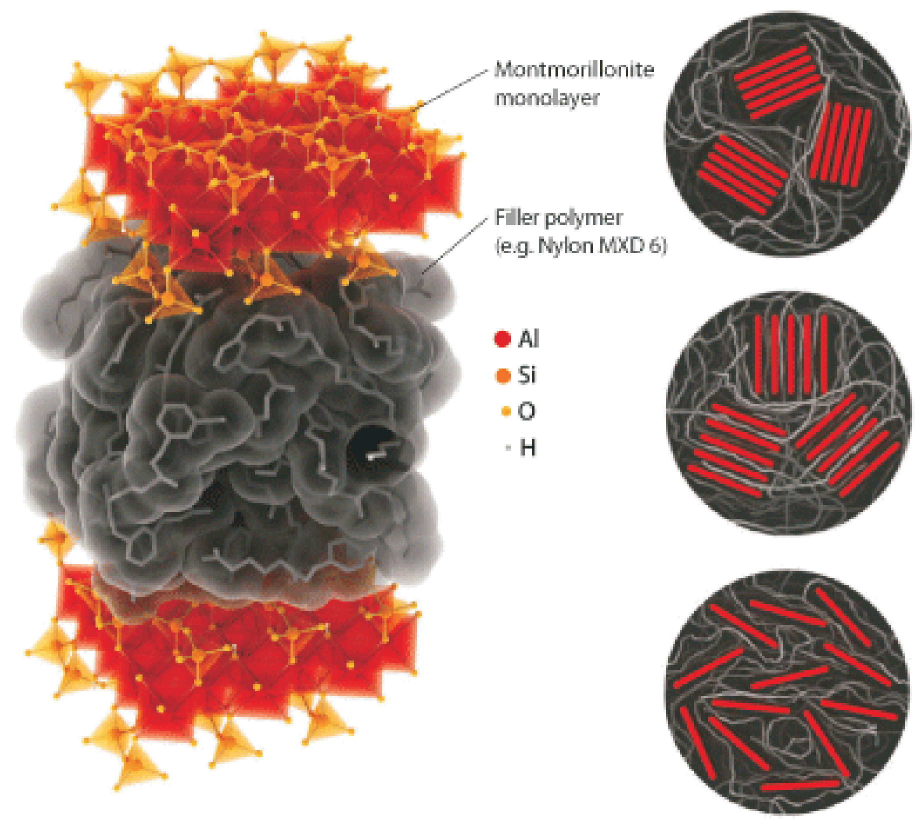
SMP currently functions on thermal activation customizable from –30°C to 260°C (–20°F to 500°F). Extremely high temperatures and cryogenic ranges may be possible. Some examples of applications include custom reusable mandrels, reusable molds, replica optics, and deployment mechanisms for outer space.

Applications

- Customized containers, adju shipping and packaging
- Actuators
- Sensors
- Space-qualifiable applicatic
- Removable mandrels
- Automotive components

There are many activatio methods for thermally responsive SMP

- Resistive heating
- Embedded heaters (for exam stretchy heaters, nichrome w
- Contact heating (MRE heate
- Induction heating
- Dielectric heating
- Microwave heating
- Infrared radiant heating



Stock Number	Product Description	Application
NS6130-09-910	Shape Memory Polymer Pellet - PMM (Injection Extrusion)	Polymer Composite
NS6130-09-911	Shape Memory Polymer Resin & Hardner - PMP (Potting)	Polymer Composite

Copper & Nickel Foam

There are two distinct types of metal foams: open-cell and closed-cell structures. The key difference between the two structures is that open-cell foams are permeable and will allow fluids to pass through the foam whereas closed-cell foams are impermeable.

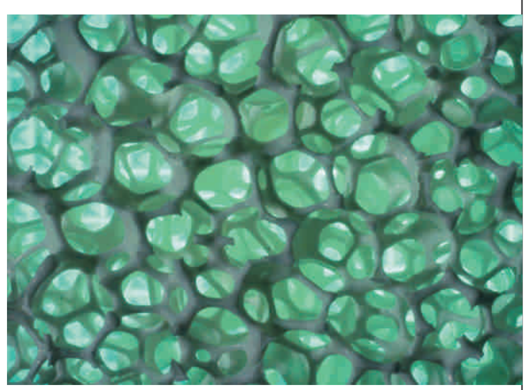
One of the key differences of microstructure is that the lace microstructure provides a greater surface area than the one found in sintered copper powder. The lace microstructure also has a significant impact on the flow of liquid through the foam (increased permeability). The distinctive microstructure ofmetallic foams has up to 100 times more specific surface area than competing manufacturers' foams. This particular microstructure also permits capillarity properties that are unmatched in the market. Capillarity is crucial in numerous wicking applications like heat pipes and vapor chambers used in the electronic cooling industry.

Application

These different metallic foams are characterized by different properties and attributes which can be used in different applications. Such applications may be found in LEDs, batteries, electrolyzers, fuel cells, as well as air, soil and water treatments to name a few.

Feature

Excellent mechanical property and process ability
Extraordinary electricity and heat conductivity
Massive three- dimensional network structure
Excellent base & corrosion resistant ability
Magnificent electromagnetic shielding ability
Superior tensile strength and favorable ductility



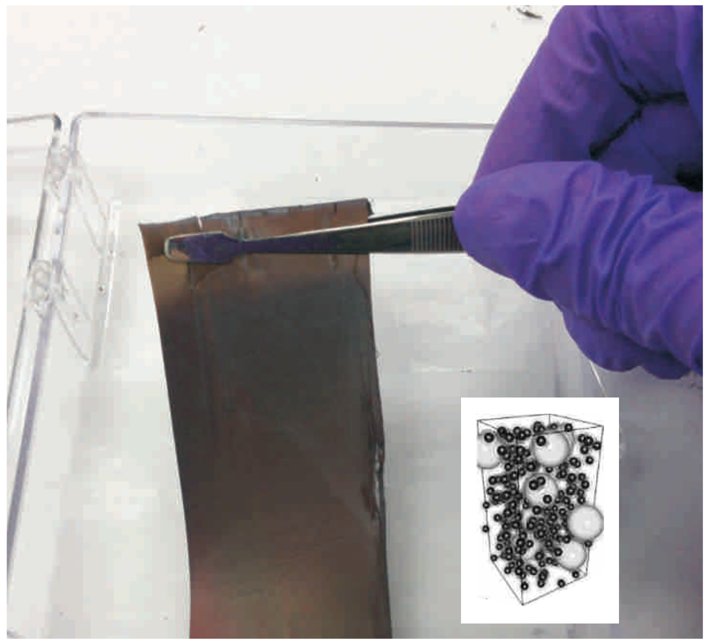
Specifications	Copper	Nickel
Number of pores per inch(PPI)	5-120	5-120
Density (g/cm3)	0.15-0.45	0.15-0.45
Thickness	0.5-- 30mm	0.5-- 30mm
Porosity	90%-- 98%	90%-- 98%
Standard size	500*500mm; thickness under 4mm can be made into roll shape.	

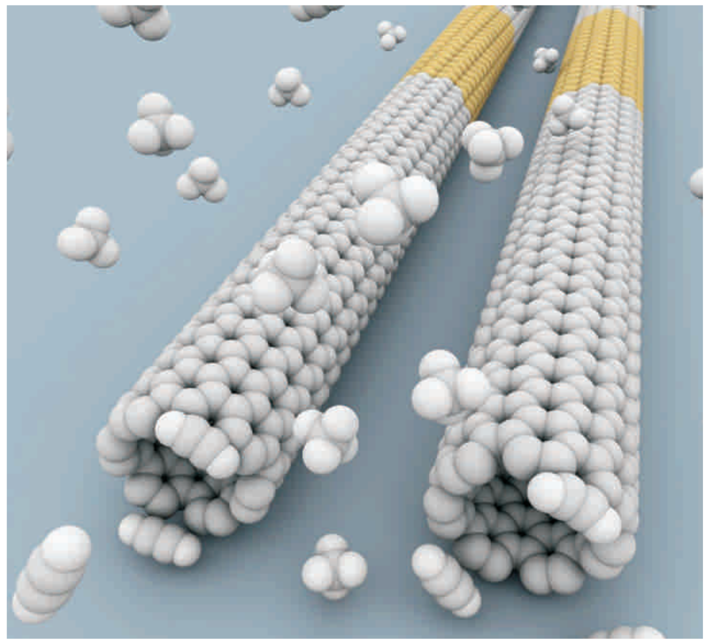
Nanoshel Conductive Nanotubes (CALIB)

Composite Additive for LI Battery

Nanoshel Conductive Nanotubes Composite (CALIB) is a Carbon Nanotubes based Conductive Additive for Lithium Ion Battery and other applications. It is a Nano Composite Material specifically designed for improving Lithium Ion Battery Performance

It is composed of Carbon Nanotubes and of grain electrode conductive additives. By adding grain electrode conductive additives to Carbon Nanotubes, the entangled Nanotubes are well separated.
More important, CALIB is very easy to be dispersed in Li-ion battery electrode, and the CNTs network can ensure the Li-ion battery having the best cycle performance, after adding Conductive Nanotubes Composite additive, the tap density of battery electrode coatings can be increased by 10%.





Property	Unit	Value
Carbon Nano Tube Diameter	Nm	20-30
Carbon Nano Tubes Length	µm	15-25
Nitrogen Surface Area	M2/g	60-75
Absorption Value	Ml/100g	>500
Density (in the bag)	g/cm3	0.18
Volume Resistivity	O.cm	2~5x10-4
Moisture (as packed)	%	0.2-0.3
Ash Content	%	0.2 max
Ni (Nickel)	%	0.005 max
Fe (Iron)	PPM	<40
Mg (Magnesium)	PPM	<35
Appearance	Powder	Black Powder
pH		8-9

Pyrolytic Graphite

Pyrolytic Graphite Plate: HOPG Substrate Materials for Scanning Tunneling Microscopy and Atomic Force Microscopy Pyrolytic Graphite (Substrate Nucleated) plate is manufactured by decomposition of hydrocarbon gas at very high temperature in a vacuum furnace.
PGS (Pyrolitic Graphite Sheet) is a thermal interface material which is very thin, synthetically made, as high thermal conductivity and is made from a High Oriented Graphite Polymer Film. Its ideal for providing Thermal management/heat-sinking in limited spaces or to provide supplemental heat - sinking in addition to conventional means. This material is flexible and can be cut into customizable shapes.

Features
Excellent Thermal Conductivity(2-4 times as high as copper, 3-6 times as high as Aluminium)
Light Weight: 0.852 to 2.1g/cm3
Specific Gravity: 1/4 to 1/10 of copper , 1/1.3 to 1/3 of Aluminium in density
Flexible and easy to be cut or trimmed
Low thermal resistance
RoHS compliant

Application
Cellular phone, DVC, DSC, PC and Peripherals
Semiconductor manufacturing equipment
Optical communication equipment

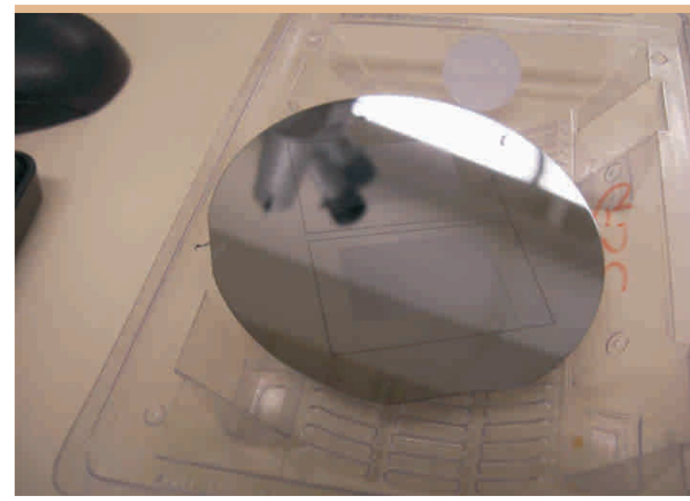
PROPERTIES

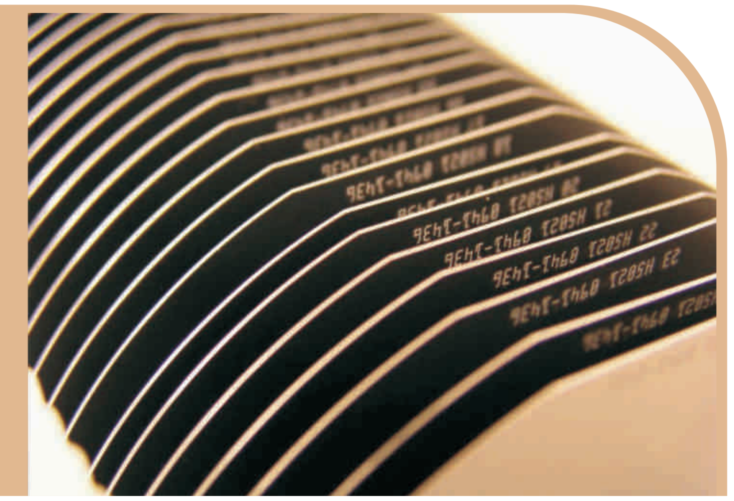
Density	2.2 gr/cm^3
Flexural Strength –AB	103.4 mpa
Compressive Strength – C	172.4 mpa
Shear Strength – AB	6.9 mpa
CTE – AB	0.5 microns/m °C
CTE – C	11 microns/m °C
Thermal Conductivity – AB	400 W(m^2 , K/m)
Thermal Conductivity – C	3.5 W(m^2 , K/m)
Resistivity (RT) AB	0.5 * 10 -^{3} ohm x cm
Resistivity (1650C) AB	0.3 * 10 -^{3} ohm x cm
Resistivity (RT) C	0.5 ohm x cm
Resistivity (1650C) C	0.3 ohm x cm
Oxidizing Atmosphere	649 °C
Method of Manufacturing	Hydrocarbon gas decomposition

Specification

Density	2.250-2 .266 g/cm3
Level spacing	0.3344 - 0.3359 nm
Sizes Available	10x10x1 (mm), 12 x 12x 1 (mm)

Nanoshel Monocrystalline Silicon Wafers

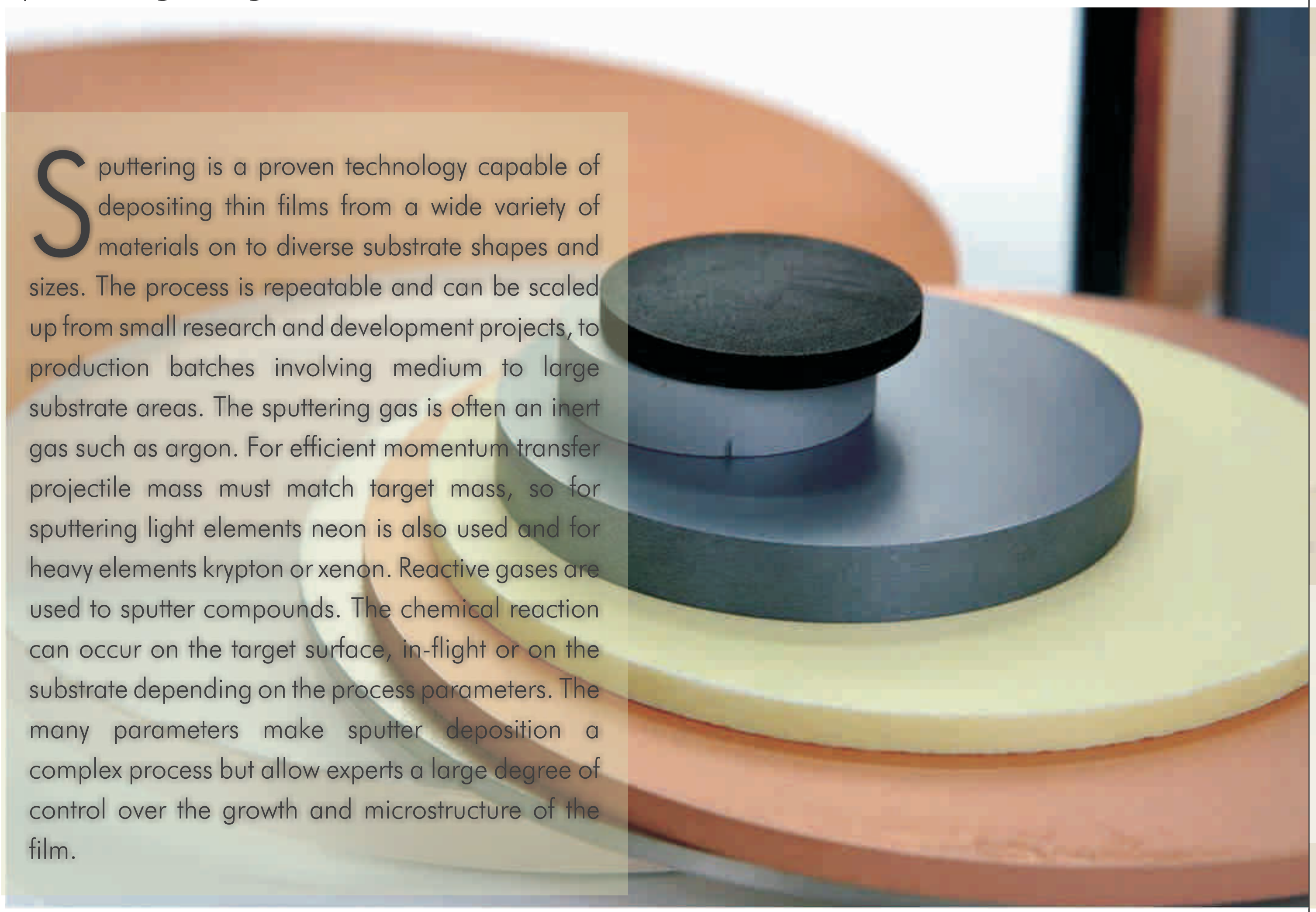




More than 90% of the earth's crust is composedof Silica (SiO_2) or Silicate, making silicon the second most abundant element onearth. When sand glitters in sunlight, that's silica. Silicon is found in myriad compounds in nature and industry. Most importantly to technology, silicon is the principle platform for semiconductor devices. The most advanced semiconductor technologies of today and tomorrow require monocrystalline Silicon with precise uniform chemical characteristics, for instance controlled dopant and oxygen content. The process to transform raw silicon into a useable single-crystal substrate for modern semiconductor processes begins by mining for relatively pure Silicon Dioxide. Most silicon now is made by reduction of SiO_2 with Carbon in an electric furnace from 1500 to 2000°C. With carefully selected pure sand, the result is commercial brown Metallurgical Grade Silicon of 97% purity or better. This is the silicon eventually used for semiconductors, but it must be further purified to bring impurities below the parts-per-billion level.

Parameter	Characteristic
Type/Dopant	P Boron, N Phosphorous, N Arsenic
Orientations	<100>, <111>
Oxygen Content	10-20 ppmA
Carbon Content	0.5 – 1.0 ppmA
Resistivity ranges	
P Boron	0.001 – 50 ohm cm
N Phosphorous	0.1 – 40 ohm cm
N Arsenic	< 0.005 ohm cm
Mechanical Properties	
Diameter	2’’ ± 0.008’’ - 6’’ ± 0.008’’
Thickness	279 ± 20 µm (standard) - 500 ± 25 µm
TTV	< 5 µm - < 15 µm
Bow	< 38 µm
Wrap	< 38 µm
Edge Rounding	SEMI-STD
Marking	Primary SEMI-Flat only, SEMI-STD Flats

Sputtering Targets



Sputtering is a proven technology capable of depositing thin films from a wide variety of materials on to diverse substrate shapes and sizes. The process is repeatable and can be scaled up from small research and development projects, to production batches involving medium to large substrate areas. The sputtering gas is often an inert gas such as argon. For efficient momentum transfer projectile mass must match target mass, so for sputtering light elements neon is also used and for heavy elements krypton or xenon. Reactive gases are used to sputter compounds. The chemical reaction can occur on the target surface, in-flight or on the substrate depending on the process parameters. The many parameters make sputter deposition a complex process but allow experts a large degree of control over the growth and microstructure of the film.

To achieve the desired characteristics in a sputter deposited thin film, the manufacturing process used to fabricate the sputtering target can be critical. Whether the target material comprises only an element, mixture of elements, alloys, or perhaps a compound; the process to produce that defined material in a form suitable for sputtering thin films of consistent quality is as essential as the deposition run parameters perfected by the thin film process engineers and scientists.

Sputtering Target of all available Metals are available

Composition	Pure Metal Targets, Alloy Targets, Compound Targets Precious Metal Targets (Gold, Silver, Platinum, Palladium, Osmium, Rhodium)
Purity	99 to 99.99%
Diameter	1" (inch) to 10" (inch)
Thickness	1mm to 10mm
Shape	Round, Square, as per customer specification

Nano Innovative Materials

Metal Crucibles

Refractory Metals

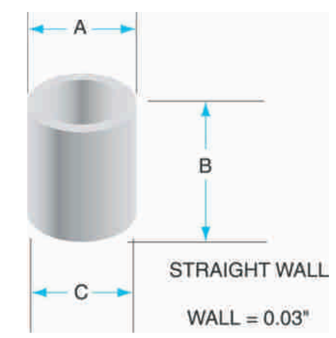
Tungsten | Molybdenum | Tantalum | Nobelium | Rhenium | Silicon

Refractory Metals Products Available

Sheet | Targets | Crucible | Tube | Rod | Wire | Ingot

Application

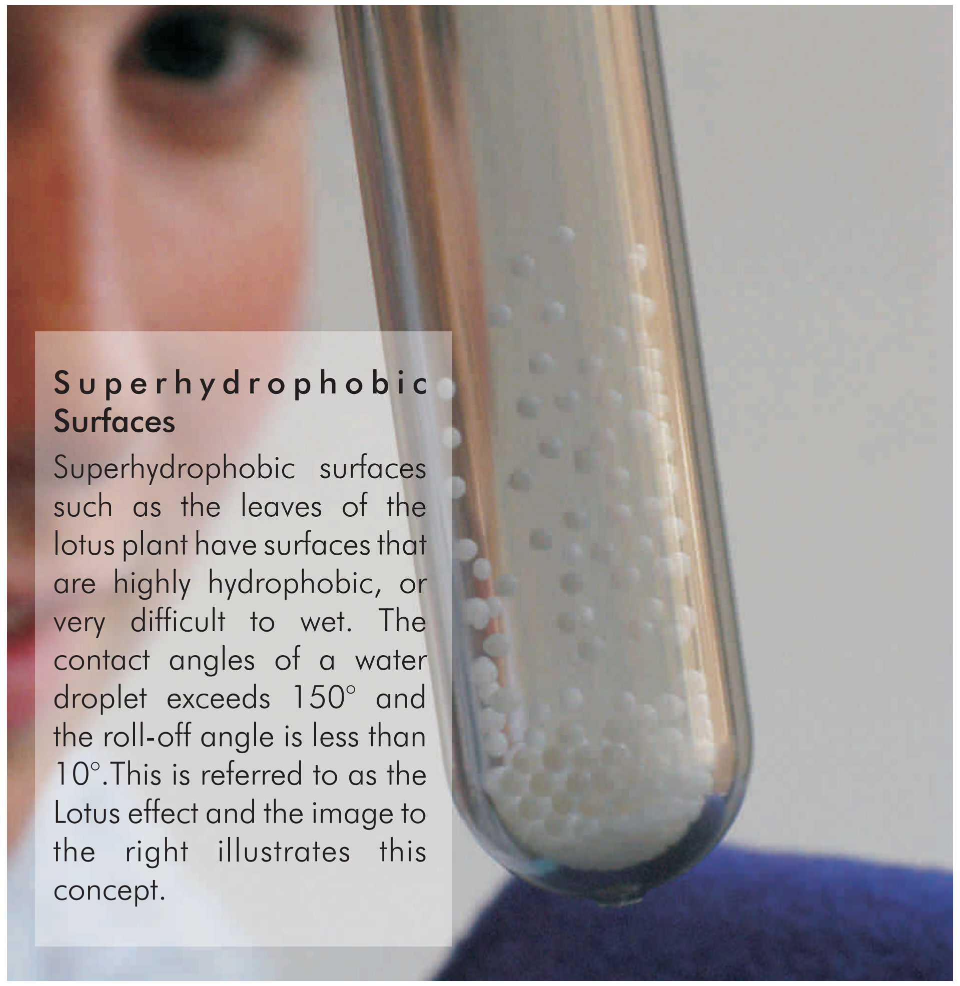
Tantalum crucible is used as container for rare-earth metallurgy, load plates for anodes of tantalum and niobium electrolytic capacitors sintered at high temperatures, corrosion resistant containers in chemical industries and evaporation crucibles and liners.



Commodity	Tantalum crucible or boats
Appearance	Silvery grey metal luster
Purity	Ta≥99.0%
Density	Not less than 16.0g/cm3
Supply state	Processing or sintering state
Quality standard	GB/T 14841-2008 (tantalum& tantalum alloy bar)
Specification	Φ (20~500) mm× (50~600) mm
Production process	Materials--- machining ---tantalum crucibles
Production equipments	CNC vertical turning machine, CNC milling machine, wire cutting machine

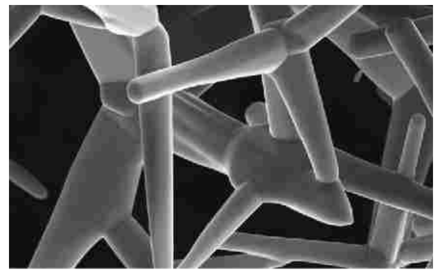
Note : Special specification can be designed according to the customers' requirements.

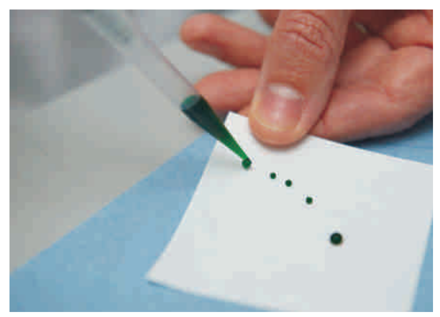
Nano Innovative Materials
Superhydrophobic Surfaces



Superhydrophobic Surfaces

Superhydrophobic surfaces such as the leaves of the lotus plant have surfaces that are highly hydrophobic, or very difficult to wet. The contact angles of a water droplet exceeds 150° and the roll-off angle is less than 10°.This is referred to as the Lotus effect and the image to the right illustrates this concept.





Hydrophobic Effect

Hydrophobic comes from the word hydro (water) and phobos (fear). It can be demonstrated by trying to mix oil and water. And, also is evident if you look at some leaves and flower petals that repel water in droplets after a rain storm. For the leaves, the water repellant can sometimes be a waxy coating on the leaves, or can be the existence of tiny hairlike projections off the surface of the leaf which causes a buffer of air between the hairs – the air keeps the water away.

Fabric Applications

Scientists and engineers who were aware of the hydrophobic effect decided to apply nanotechnology to the surfaces of fabrics to make them water proof too! The waterproof feature often also helps protect fabrics from staining because liquid cannot easily soak into the fabric fibers. A good example is adding nano "whiskers" to cotton fibers in the same way that some
leaves have little "hairs" on their surface. Creating the effect for fabric is a little tricky – a cotton fiber is shaped like around cylinder, and add tiny nano "whiskers" all around the cylinder so it has a fuzzy surface.
The fabric doesn't appear any different or feel any different, but it does repel liquids. And, because liquids do not soak into the fabric, the process also helps the fabric resist staining too.

Nano Innovative Materials
Nanoclays for Nanocomposite

Nanoshel Nanoclays are derived from naturally occurring clay mineral especially purified and processed in order to obtain nanoclay suitable for the production of a nanocomposite material. Polymer-clay nanocomposite represents one of the most interesting classes of materials developed in recent years. Nanocomposite provide dramatic improvements if compared with virgin polymers. Moreover the content of nanoclay is often included in the following range: 2-5% weight.

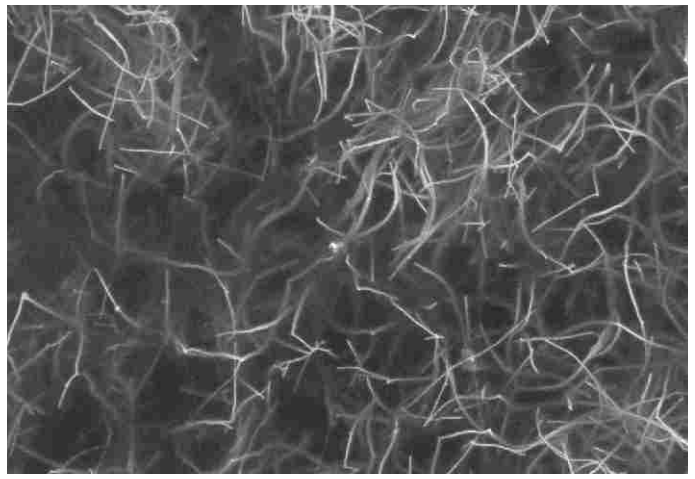
Some of the most important improved properties are the following:
- Flame retardancy and thermal stability
- Mechanical properties: stiffness, melt fracture reduction, tension, compression and bending
- Barrier properties to oxygen, CO_2, vapor barrier and solvent resistance

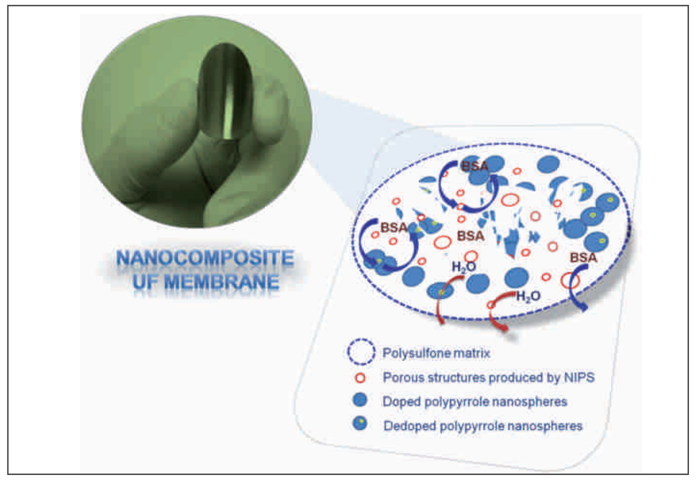
Some of the opportunities for Adhesives and Sealants are following:
- Rheology control : Nanomaterials maintain low viscosity even at very high levels of loading. Nanoparticles have been noticed to achieve 40-60% loadings without adverse effect on rheology.
- Mechanical properties : High filler loadings and the unique aspect ratios of Nanoparticles make them ideal reinforcing fillers.
- Anti-microbial properties : Active elements are far more available and effective in nano-form.
- Coating thickness reduction : Coating thickness can be reduced by virtue of the high solids content at low viscosity; thus, thinner coatings can be produced with better coating uniformity.
- Tagging security applications : Nanomaterials can be tagged for tractability with various elements. They also can be made magnetically or optically active.
- Ceramic adhesives : Nano ceramic powders can be made to have properties and application characteristics similar to organic adhesives. Thus, one could have a very high temperature and chemical resistant adhesive that is as easy to apply as an epoxy.

Stock Number	Product Description	Application
NS6130-09-901	Clay Nanopowder, >99%, 80 -150 nm	Rheology control
NS6130-09-902	Montmorillonite Nano Clay, >99%, <80nm	Coating thickness reduction
NS6130-09-903	Perlite Nano Clay, >99%, <80nm, 80 -150 nm	Tagging security applications
NS6130-09-904	Expanded Perlite Nano Clay, >99%, 80 -150 nm	Tagging security applications
NS6130-09-905	Zeolite Nanopowder, >99%, <80nm	Ceramic adhesives
NS6130-09-908	NanoClay (Modified COOH), >99%, <80nm	Ceramic adhesives

Many aerospace applications require electrically conducting polymer based composites for static discharge, electrical bonding, interference shielding, primary and secondary power, and current return through the structure. Existing carbon fibre reinforced polymer composites are unable to achieve all these requirements due to the presence of insulating resin regions within the composite structure. Secondary conductive materials such as foils, wires, straps and/or coatings have typically been incorporated into the structure to improve the electrical properties and all of which require additional unwanted processing steps.

One of the objectives of the Nanoshel Nanocomposite is improvement of electrical conductivity of composite laminates primarily in order to fulfil the requirements for lightning strike protection but also for electrical grounding, electrical bonding and EMI shielding.





For the improvement of the composite electrical conductivity using:

- Dispersed carbon nanotubes (CNT) in the resin matrix.
- Carbon nanofiller based "buckypapers".

The first solution involves the addition of conductive particulates in the matrix itself. Recent studies have showed that a small amount of multi wall carbon Nanoshel nanotubes (MWCNT) relatively well dispersed into a polyester resin have the ability to reduce the resistivity of the liquid (and solid) polymer by several orders of magnitude.

The addition of Nanoshel MWCNT and other conductive nano-fillers such as carbon nanofibre (CNF) can increase the electrical conductivity of epoxies and BMI resins to a level sufficient to ensure electrical continuity within composite structures. The levels of nano fillers and the dispersion method can then be optimised for improved electrical conductivity. Several dispersion methods will be assessed, including high torque/ high shear mixing, horn sonication dispersion and shear dispersion using a triple rolls mill. The enhanced resins can be used in both the bulk composite as well as highly thermally conductive surface resin layers.

Membrane technology

The nano filtration technique is mainly used for the removal of two valued ions and the larger mono valued ions such as heavy metals. This technique can be seen as a coarse RO (reversed osmosis) membrane. Because nano filtration uses less fine membranes, the feed pressure of the NF system is generally lower compared to RO systems. Also the fouling rate is lower compared to Ro systems

There are two types of membranes

Spiral membranes, cheapest but more sensitive for pollution
Tubular/ straw membranes, the most used membranes seen the costs and effect, shall not easily be polluted

The surfaces from the filter determine the capacity from the filter. Spiral membranes have l the biggest surface area in general and are therefore the most cheapest in use. The surface area from Tubular/ straw membranes is less in general.The pre purifying of the feeding water has a influence on the performance of the installation. The need of pre purifying depends on the feeding water quality.
Installing pre cleaning has the following advantages:
Long-life, Long production of the installation is possible, Simple management
Besides pre cleaning, chemical doses can be taken place to prevent scaling, precipitation on the surface from the membrane.

NANO FILTERING

Silicon carbide (SiC) is a new and revolutionary Nano Filter with superior chemical & mechanical properties. The SiC nano filters have unique advantages of:

Benefits	Features
•Reduce your foot print and system costs	•HIGHEST FLUX for any filtering material
•Fast cleaning, more efficient chemical cleaning	•Chemically inert (pH 0-14)
•Unmatched performance in oil/water separation	•Thermally resistant up to 800 °C
•Long life time	•Completely stable in solvents
•Less down time and maintenance	•Accepts any amount of oxides

Stock Number	Product Description	Application
NS6130-02-206	Silicon Carbide Submicron Powder (SiC, Beta, 99+%, D<1 um)	Chemically Inert
NS6130-02-207	Silicon Carbide Micron Powder (SiC, Beta, 99+%, 1-40 um)	Completely Stable
NS6130-02-208	Silicon Carbide Nanopowder (SiC, Beta, 99+%, <80 nm)	Oil Water Separation

Customized Nano Lubricants

Nanoshel provide lubricants, grease and diesel fuel products containing our Nano-D additives which enhances the performance such as longer live span, better lubricity, improved and cleaner combustion, etc.

Any material with particle size less than 100nm (0.1 micron meter) is defined as Nanoparticles. Nanoparticles its reactivity increases with the decrease in size. Smaller the particle size, higher the surface area. Nanoparticles have a very high surface area to volume ratio; due to this a higher percentage of atoms (in Nanoparticles) can interact with other matter. Therefore Surface Area (measured in Square meters per gram) is most important unit of measure for a nano lubricant. Higher the surface area, higher the lubricity.

Nano lubricant powders

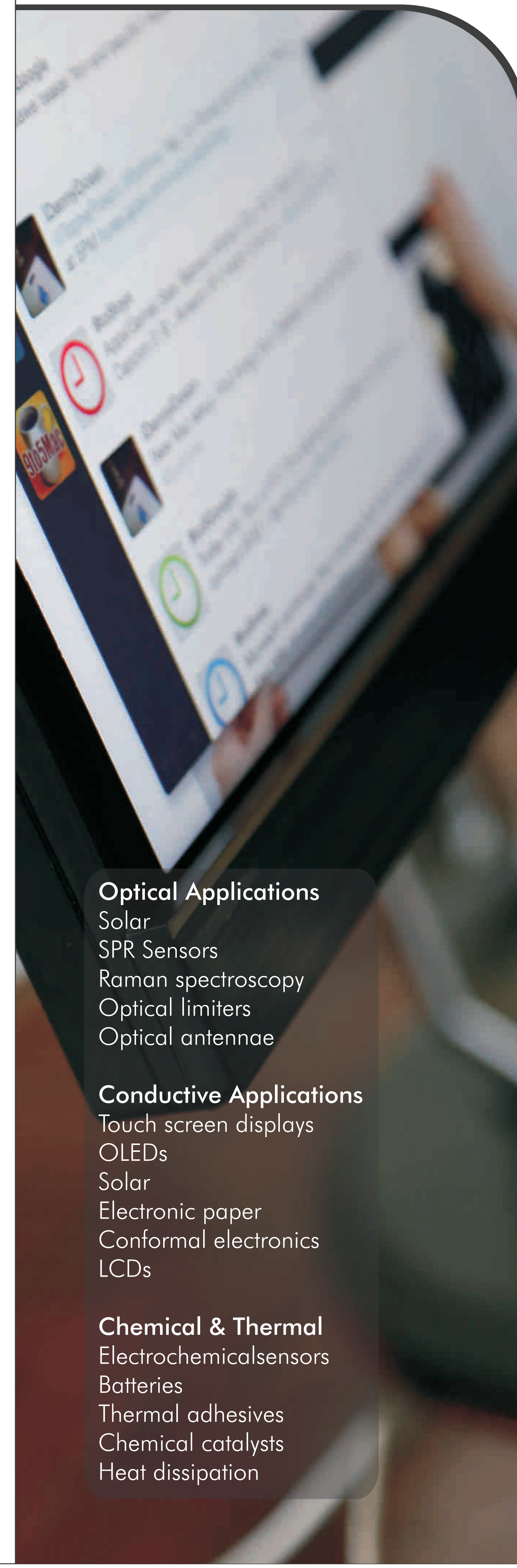
Tungsten Disulfide (WS2) Nanopowder (Purity: 99.9%) - NS6130-02-215
Hexagonal-Boron Nitride (hBN) Nanopowder (Purity: 99.9%) - NS6130-02-201
Molybdenum Disulfide (MoS2) Nanopowder (Purity: 99.9%) - NS6130-02-238
Graphite (nano) Powder (Purity: 99%) - NS6130-01-113

Latest Developments in Nano lubrication

NANOSHEL® utilizes Nano science solutions to meet industrial lubrication challenges and also address the latest developments in corrosion control and fuel enhancement for transportation, marine, industry, and heavy equipment.

NANOSHEL® supplies nano additives for lubricant and grease manufacturers to enhance their products by evolving from toxic and inferior EP/AW additive packages to a more efficient and cost effective nano technology.

NANOSHEL® offers technology made from nano potassium borate, hexagonal boron nitride (hBN), tungsten disulfide (WS_2) plus other advanced complex Nano particle solutions.



Optical Applications
Solar
SPR Sensors
Raman spectroscopy
Optical limiters
Optical antennae

Conductive Applications
Touch screen displays
OLEDs
Solar
Electronic paper
Conformal electronics
LCDs

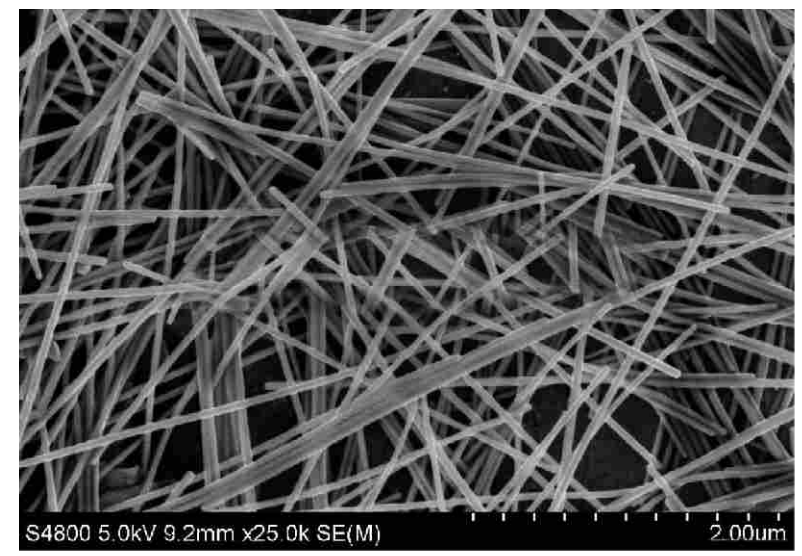
Chemical & Thermal
Electrochemicalsensors
Batteries
Thermal adhesives
Chemical catalysts
Heat dissipation

White Polymer Light Emitting Diodes

Silver nanowires used in developing efficient white polymer light-emitting diodes

White polymer light-emitting diodes (WPLEDs) can be used in flat panel displays and solid state lighting due to their solution processability that could lead to low-cost production. In addition, the WPLEDs could also potentially be made flexible and even stretchable. But, recent organic and polymer LEDs all exhibit a large discrepancy between internal quantum efficiency and external quantum efficiency due to their low light outcoupling efficiency.

In order to enhance the low out-coupling efficiency, where most of them were used for ITO/glass substrates. Morever, the plastic substrate, e.g., polyethylene terephthalate (PET) used in flexible LEDs has an even lower out-coupling efficiency for it's high refractive index (nPET = 1.66). Furthermore, the plastic substrates can not survive the high temperatures that some of the enhancement techniques involve.



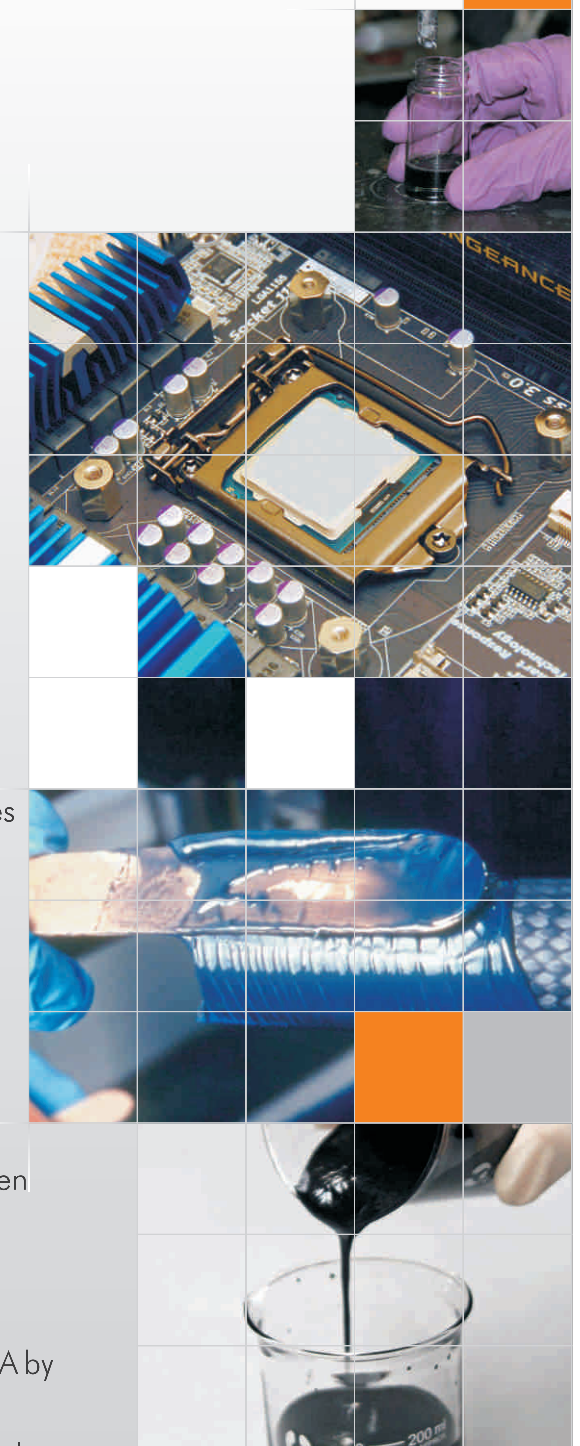
By employing a silver nanowires (AgNW)–polymer composite as the electrode/substrate to replace ITO/glass, highly efficient WPLEDs can be fabricated. The resulting LEDs have fewer light reflection interfaces. Furthermore, the silver nanowires embedded in the surface layer of the composite electrode/substrate function as scattering centers and suppress the waveguide mode in the polymer layer. The out-coupling efficiency, and thus the luminous efficiency of the WPLEDs are significantly increased as compared to the parallel devices using ITO/glass substrates.

Nano-technology is a dynamic research field that covers a large number of disciplines including construction industry. Concrete is a material most widely used in construction industry. Concrete is a cement composite material made up of Portland cement, sand, crush, water and sometimes admixtures. Interest in nano-technology concept for Portland-cement composites is steadily growing. The materials such nano-Titania (TiO_2), Carbon nanotubes, nano-silica (SiO_2) and nano-alumina (Al_2O_3) are being combined with Portland cement. There are also a limited number of investigations dealing with the manufacture of nano-cement. The use of finer particles (higher surface area) has advantages in terms of filling the cement matrix, densifying the structure, resulting in higher strength and faster chemical reactions (e.g. hydration reactions).

Nano-cement particles can accelerate cement hydration due to their high activity. Similarly, the incorporation of nano-particles can fill pores more effectively to enhance the overall strength and durability. Thus nano-particles can lead to the production of a new generation of cement composites with enhanced strength, and durability.

Following is a list of areas, where the construction industry could benefit from nano-technology.

- Replacement of steel cables by much stronger carbon nanotubes in suspension bridges and cable-stayed bridges - Carbon Nanotubes
- Use of nano-silica, to produce dense cement composite materials - Silicon Dioxide Nanoparticles (SiO_2)
- Incorporation of resistive carbon nanofibers in concrete roads in snowy areas Incorporation of nano titania, to produce photocatalytic concrete - Titanium Dioxide Nanoparticles (TiO_2)
- Use of nano-calcite particles in sealants to protect the structures from aggressive elements of the surrounding environment
- Use of nano-clays in concrete to enhance its plasticity and flowability - Clay Nanopowder
- Urban air quality could be improved by if the civil structures are treated with nano TiO_2



Thermal interface materials (TIMs) are used in electronics packaging to increase heat conduction across the interface between two relatively flat surfaces. A good TIM will have both high conductivity and the ability to conform and contact the surfaces well There are a number of compositions of the TIM, but they typically involve mixtures of a highly conductive filler and a Fluid carrier In some other cases, the TIM may also have the conductive paste on a metallic foil to stabilize the thickness of the material. The particle Filler are often highly conductive metals such as silver or copper particles. Performance of a TIM is based on the ability of the paste to Flow and contact the surfaces in question while at the same time having very good contacts between the particle Fillers that lead to the maximization of the conduction paths from surface to surface.

Carbon Nanotubes Conductive Paste (TIM)

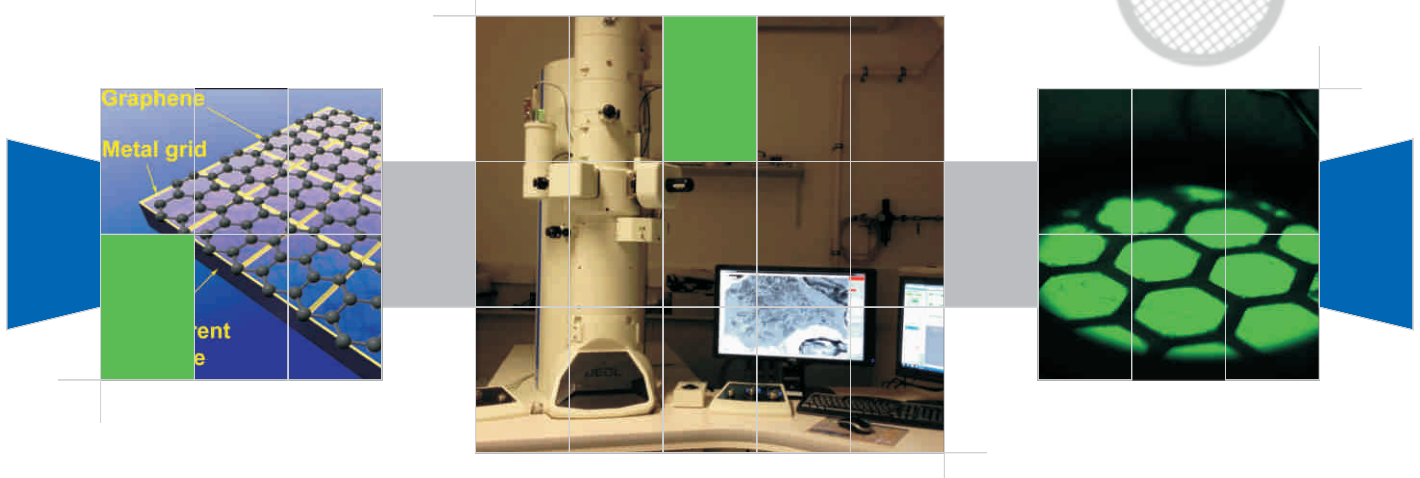
Properties

Pigment	Carbon Nano Tubes
Color	Black
Viscosity	±20,000 cps
Curing time	120°C for 30 minutes 130°C for 15 30 minutes 140°C for 5 to 10 minutes
Coverage	250 sq.ft / kg
Density	1 kg / l
Sheet resistance	2 mm x 1"- length track
Track resistance	< 12 k ohms [2 mm x 1" x 0.5]
Screen wash	Methyl ethyl Ketone
Max service temp	150°C
Consistency	Screenable thick Paste. High residence on screen
Adhesion	Non scratchable
Screen mesh	T 140S
Screen squeeze	Use solvent resist squeeze
Dilution	Ready to use. If dilution requires, add 2% of ECA by volume (little by little)
Storage	avoid heat exposure & sunlight. Keep in a cool place, do not freeze
Shelf life	6 months under original seal
Usage	Mix the content well before use.
Packing available	500gms, 1kg, and as per customer requirement.

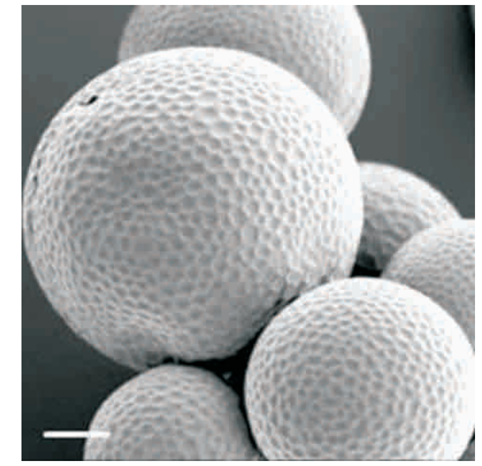
Electron Microscope Metal Grids

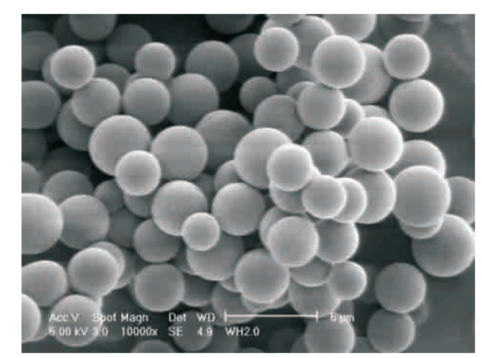
Most biological EM work is done on small (several millimeters) copper discs called grids cast with a fine mesh. This mesh can vary a lot depending on the intended application, but is usually about 15 squares per millimeter (400 squares per inch). On top of this grid, a thin layer of carbon is deposited by evaporating carbon graphite onto it. It is on this thin carbon film that the sample will then rest so that it can be examined in the microscope. Carbon is generally a hydrophobic substance (that is, it repels water), and if a drop of water is placed on it, the water will want to minimize it's contact with the carbon. To make the surface more accessible to water and the suspended sample, the carbon needs to be made hydrophilic. This is accomplished by glow discharging. In glow discharging, the carbon coated grids are placed inside a partly evacuated chamber connected to a power supply. When high voltage is applied between the cathode and anode at each end of the chamber, the electron potential ionizes the gas within the chamber. These negatively charged ions then deposit on the carbon, giving the carbon film an overall hydrophilic (water attracting) surface.

After a small drop of the sample is placed on the hydrophilic grid, it needs to be stained so that the sample can be easily differentiated from the background. Transmission electron microscopy uses a high energy electron beam to bombard the sample. Depending on the amount of energy that was absorbed by the sample, the intensity of the beam that hits the viewing screen varies, and an image is made (remember that contrast arises from the beam interacting with the sample). However, carbon, oxygen, nitrogen, and hydrogen, the main components of biological molecules, are not very dense, and the amount of electrons they absorb is minimal compared to the intensity of the electron beam. Therefore, for normal EM viewing, samples are stained with a heavy metal salt that readily absorbs electrons. This is usually lead, tungsten, molybdenum, vanadium, or depleted uranium. After staining, the sample is blotted, air dried and ready to be examined in the microscope.



Silver Coated Microspheres - EMI Shielding





Nanoshel use proprietary process of wet chemistry to coat microspheres with a thin layer of silver that allowed the finished product to perform like silver in electrical conduction and infra-red (IR) reflection AND simultaneously perform like a ceramic in thermal insulation, low cost, low maintenance and ease of use. Silver Coated Microspheres from Nanoshel are extremely reflective and can exhibit an EMI shielding effectiveness of 60dB from 100 MHz to 25 GHz and higher.

Developed to produce electrically conductive coatings which can be added to tiles, fabrics, adhesives, sealers, plastic, rubber, composite and resin materials. When added at appropriate ratios, these materials can then provide electrical conductivity and shielding of electronic devices against Electro Magnetic Interference (EMI). The low particle density and large surface area facilitates slow phase separation in paints and adhesives compared to heavy metallic and inorganic fillers.

General Information

- High performance with long term conductivity due to excellent oxidation resistance
- Large weight reductions are possible compared to metal powders
- Typical coatings from water base paints show a conductivity of 0.1 to 0.3 ohms per square, depending on thickness

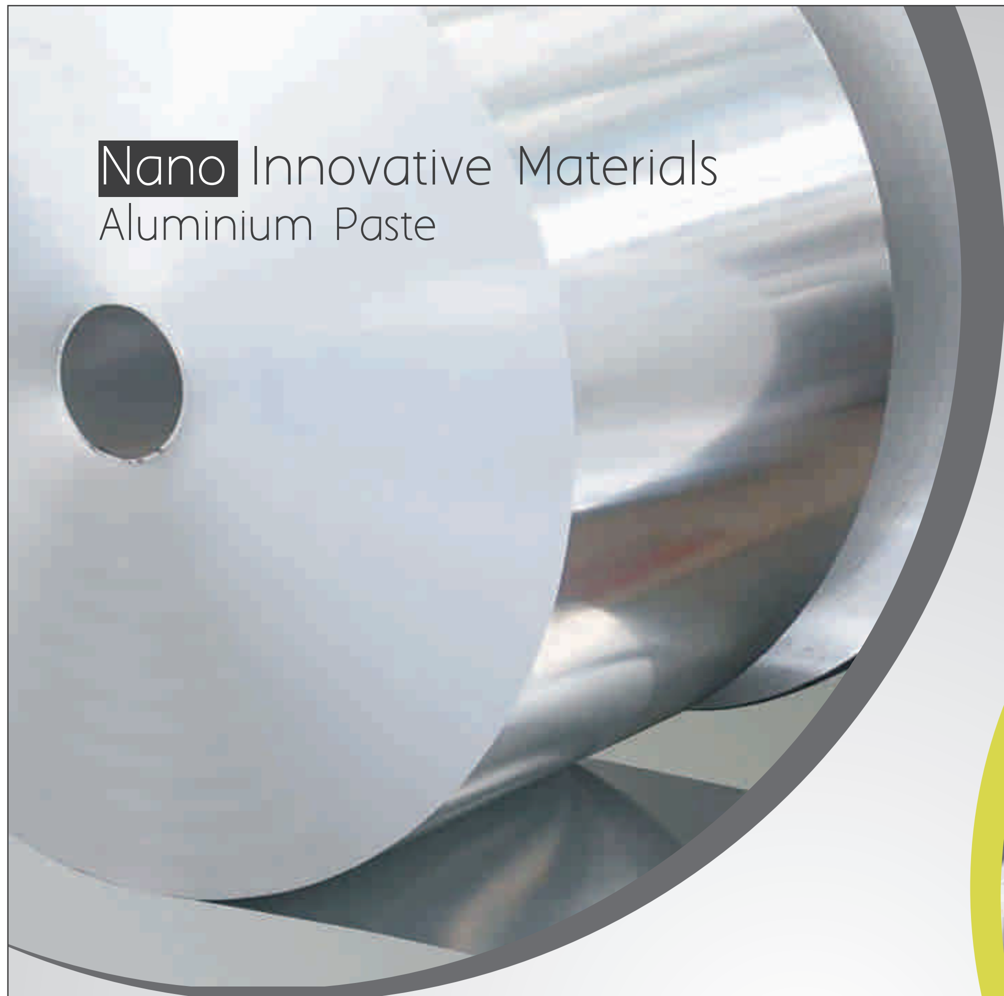
Typical Physical Parameters

Substrate Microspheres	Hollow, Ceramic Magnetic Particles
Appearance	Light Gray to Light Tan Powder
Particle Size	5 - 70 Microns in Diameter
Silver Thickness	500 – 600nm
Mechanical Strength	Approximately 3800 psi
Heat Resistance	960° degrees C (Melting Point of Silver)
Ceramic Stable	1,200° C
Specific Gravity	0.38 Apparent Tamped
Apparent specific gravity	0.38
True specific gravity	0.69

Note

Material can be sprayed, calendared or injection molded under proper conditions
Compatible with most binder systems
Conductivity generally begins at loadings of 30% by volume

Aluminium Paste



This is made from aluminium foil or aluminium powder, depending on the end use, by ball milling in white spirits solvent with lubricant present. The parameters of milling determine the nature of the product but generally it will be a two- dimensional flake, of a mean size from 8 – 35 microns in diameter (the third dimension is very small 0.1 – 0.5 micron). Dry ball milling in the presence of an inert gas is practised for special end uses. The majority of paste is made from 99.5 – 99.7% aluminium. The solvent component is usually white spirits and/ or naphtha, but special products are available with other solvents according to use, such as isopropyl alcohol, ethyl acetate, xylene etc. The generic types of product available are: leafing paste & non-leafing paste

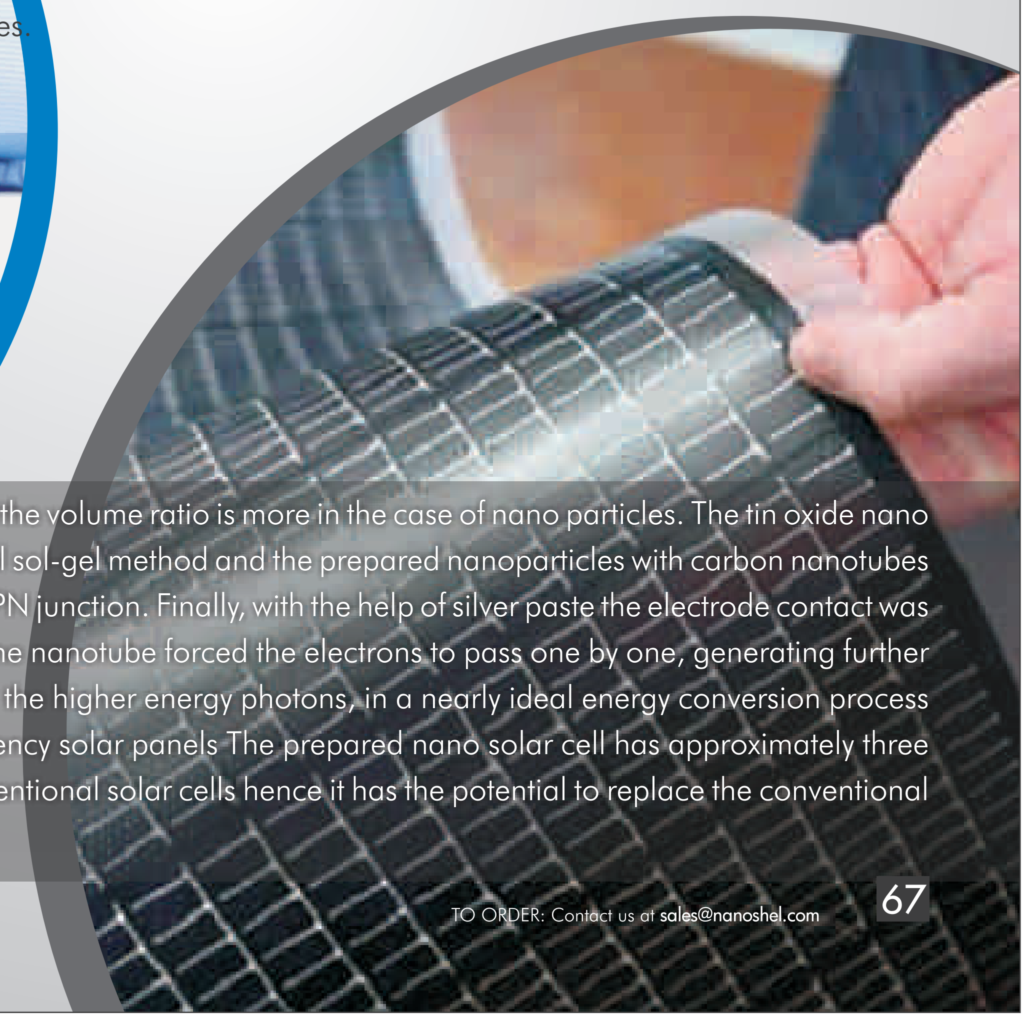
About 80% of all production is leafing paste and the most usual applications are:-
sAnti-corrosion paints sReflective roof coatings with bitumen etc. sFeed to Aluminium flake powder production sPrinting inks

The other 20% of production is non-leafing aluminium paste which has wide application as a coloured paint
pigment. It is used in industrial finishes of many kinds: Hammer finish, coil coating,

Nano Solar Cell With Carbon Nano Tubes

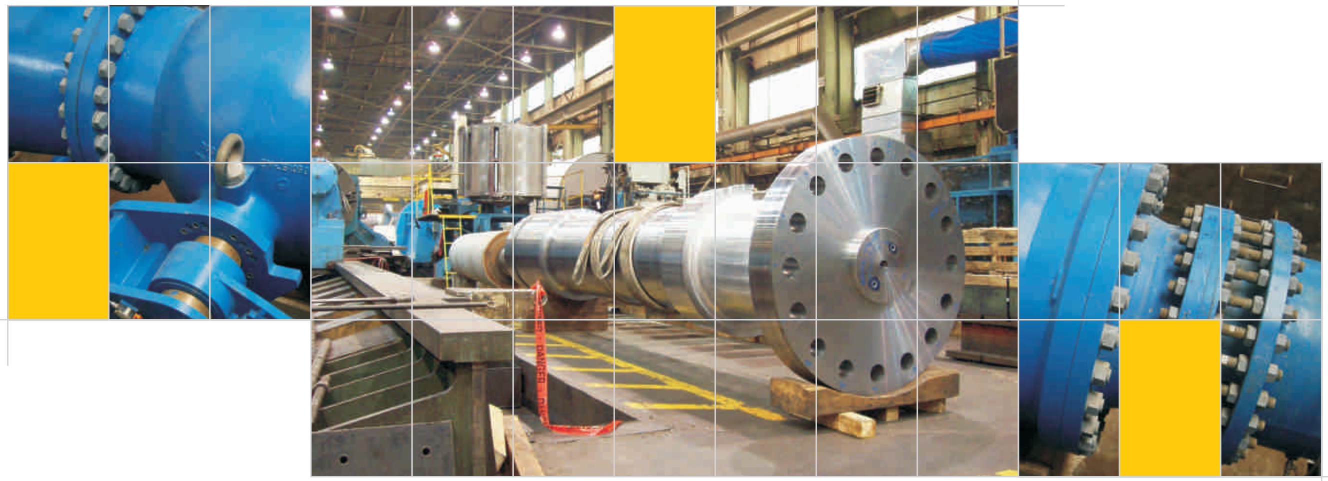
Energy is the key input to drive and improve the life cycle. Primarily, it is the gift of the nature to the mankind in various forms. The consumption of the energy is directly proportional to the progress of the mankind. With ever growing population, improvement in the living standard of the humanity, industrialization of the developing countries, the global demand for energy is expected to increase rather significantly in the near future. The primary source of energy is fossil fuel, however the finiteness of fossil fuel reserves and large scale environmental degradation caused by their widespread use, particularly global warming, urban air pollution and acid rain, strongly suggests that harnessing of non-conventional, renewable and environmental friendly energy resources is vital for steering the global energy supplies towards a sustainable path.

Solar energy can play a vital role in narrowing the gap between demand and the supply of the electrical energy. The major hurdle in the usage of the solar cells is there poor efficiency and high cost. The nano solar cells get rid of both the problems, as the nano cells are having high efficiency and fewer costs as compared to the conventional solar cells. The efficiency has be en increased by the implementation carbon nano tubes, which provides a hindrance free path the electrons once it gets energy from the photons. As the fundamental property of nano particle is well that, the number of free electrons on the nano particle surface is very high as compared to the micro particles.



The reason being the surface area to the volume ratio is more in the case of nano particles. The tin oxide nano particles were prepared by traditional sol-gel method and the prepared nanoparticles with carbon nanotubes coated over the silica wafer to make PN junction. Finally, with the help of silver paste the electrode contact was taken. The very narrow structure of the nanotube forced the electrons to pass one by one, generating further electrons with the spare energy from the higher energy photons, in a nearly ideal energy conversion process that could be the key to higher efficiency solar panels The prepared nano solar cell has approximately three times higher efficiency than the conventional solar cells hence it has the potential to replace the conventional solar cells.

Nanotechnology Solution for Hydro Abrosive Erosion



Hydro-abrasive erosion due to high concentration of hard particles results in high revenue losses due to productivity losses, efficiency reduction and repair work and outage times. The damages can be so high that the mechanical integrity of the turbines is not given anymore, which could lead to severe accidents. Use of a hard coating of Nanomaterials like WC (Tungsten Carbide) on the runners and related components at the 1,500 MW Nathpa Jhakri plant in India significantly decreased damage as a result of hydro abrasive erosion. The coated units have operated successfully through the monsoon season with minimal damage.

Hydro-abrasive erosion is dependant of the particle parameters (concentration, mineral composition, particle size distribution and shape) and on the turbine and operation parameters. The particle parameters are dependent on the water source. Rivers in relative young geological formation have a high particle load during the monsoon season or the snow melting period. In addition, the abrasiveness of these particles highly depends on the constitution of the rocks in the catchment area, so that these particles can be mainly hard particles like quartz, magnetite, feldspar and zircon. In addition, based on the geography, hydro power plants have often no extensive reservoir in which a substantial sedimentation can take place, but are run-of-the-river hydro power plants.

Stock Number	Product Description	Application
NS6130-02-207	Silicon Carbide Micron Powder (SiC, Beta, 99+%, 1-40 um)	Completely Stable
NS6130-02-208	Silicon Carbide Nanopowder (SiC, Beta, 99+%, <80 nm)	Oil Water Separation

The particle shape is mainly angular or only sub-rounded, which increases the aggressiveness of the particles. During the monsoon, soil erosion in the catchment area increases, and about 99% of the entire amount of particles are transported during four to five months (May to September). But particle loads fluctuate significantly over the years and can vary between the lowest and highest yearly average by a factor of three. Abrasive particles in the water resulted in significant damage to the runners (left) and guide vanes (right) of the four units in the 1,500 MW Nathpa Jhakri facility. These damages can be repaired easily

NANOSHEL® Creating Miracles in Black

Product List

- Product List 1 - Metal Nano Powder
- Product List 2 - Nanopowder Compounds
- Product List 3 - Oxide Nanopowder
- Product List 4 - Nanopowder Dispersions
- Product List 5 - Single Walled Carbon Nanotubes
- Product List 6 - Multi Walled Carbon Nanotubes
- Product List 7 - Alloy Nanopowder
- Product List 8 - Micro Powder
- Product List 9 - Clay-Shape Memory Polymer
- Product List 10 - Silicon Wafer
- Product List 11 - Sputter Targets
- Product List 12 - Innovative Materials

Nanobased Product Listing