



[www.nano.ir](http://www.nano.ir)  
[www.INDnano.ir](http://www.INDnano.ir)  
[www.nanoproduct.ir](http://www.nanoproduct.ir)

**I R A N • N A N O •  
T E C H N O L O G Y  
P R O D U C T S • •  
A N D • • • • • • •  
E Q U I P M E N T •**

Transportation and Energy, Oil and Related Industries






God willing, the country will see your progress and this direction of work toward market and wealth is very important. It means that this knowledge-based companies can literally use this program. This will make your scientific and research work more effective in people living environment. This is a guarantee of your work advances.

**Part of statement by Supreme Leader of Islamic Revolution to the nanotechnology family, 31th January, 2014.**



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The perspective of  
**IRAN NANO**  
products and market



In the twenty-year perspective of the country (2006-2026), Islamic republic of Iran has been considered a developed country, having the first place of economic, science and technology between the countries nearby, inspiring in Islamic world and having acceptable and effective interaction with the international community. Accordingly, the Iran Nanotechnology Innovation Council was established in 1382 to build coordination and create synergy between the executive headquarters of the country. The viewpoint of Iran Nanotechnology Innovation Council to develop(promote) nanotechnology was the development of a long-term activity framework of Iran in this field, so the first ten-year strategic program of nanotechnology was prepared and then passed by the government cabinet.

In the first ten-year, going forward to this perspective, some effective steps were taken and a pattern of scientific and targeted movements toward the development of nanotechnology was obtained.

In this document, attempts have been made to keep the goals and the way achieving them updated so that the country pioneering in this newfound technology continues better than before.

The document of the nanotechnology development has been compiled based on the evaluations of the first ten-year document implementation and its feedbacks and also based on new approaches and policies in the development of science and technology.

In the new era (nowadays), the main goals are increasing the country scientific authority, developing the nano industry and market and role-playing of this technology in the people's lives.

According to this view, nanotechnology advances in Islamic Iran would improve people's quality of life by having impact on the country developments and producing wealth until the year 1404. Due to this approach, a perspective (overview) and three main goals have been considered for the second ten-year nano advances in the country which are as follows:

Increasing the impact of nanotechnology on improving of people's quality of life.

Attainment of the country to an appropriate position in nanotechnology and science throughout the world.

Getting a proper share of the nanotechnology global market.

# INTRODUCTION

## Iran nanotechnology products book

Nanotechnology advances with the aim of producing wealth and improving people's quality of life have led to the production of various industrial products in different fields. For introducing industrial products which have nanoscale certificates, the eighth edition of books relating to nanotechnology products and equipment have been published in six volumes. In the present book (first volume), products related to buildings, paints and resins and home appliances are introduced.

## Iran nanotechnology assessment unit

The assessment unit of Iran nanotechnology products was established with the support of Iran Nanotechnology Innovation Council in 1386 to increase customers' trust and improve nano products quality. The main mission of this unit is evaluating properties of a product, approving the product being nanoscale and granting a nanoscale certificate. Checking more than 2000 cases and giving certificates to more than 450 products is one of the achievements attributed to this unit over years.

## The product assessment unit services

- Preliminary assessment (evaluation) of nanotechnology product technical documents
- Inspecting and granting nanoscale certificates
- Giving support for the product characterization and completion of technical documents
- Giving support to do operational tests and to get technical verifications
- Giving support to do quality control tests for nano B2B products
- Monitoring the market of nano products
- Creating a database of nano products and companies
- The supports of Iran Nanotechnology Innovation Council and the Corridor from companies having nanoscale certificates.

# Nonotechnology product indicators

According to the international standard ISO/TS8004 and the national standard 21145 (Nanotechnology, words and terms and main definitions) nanotechnology product is a product which its applications and properties is based on nanotechnology or improved by nanotechnology.

Products having three conditions listed below are named nanotechnology products:

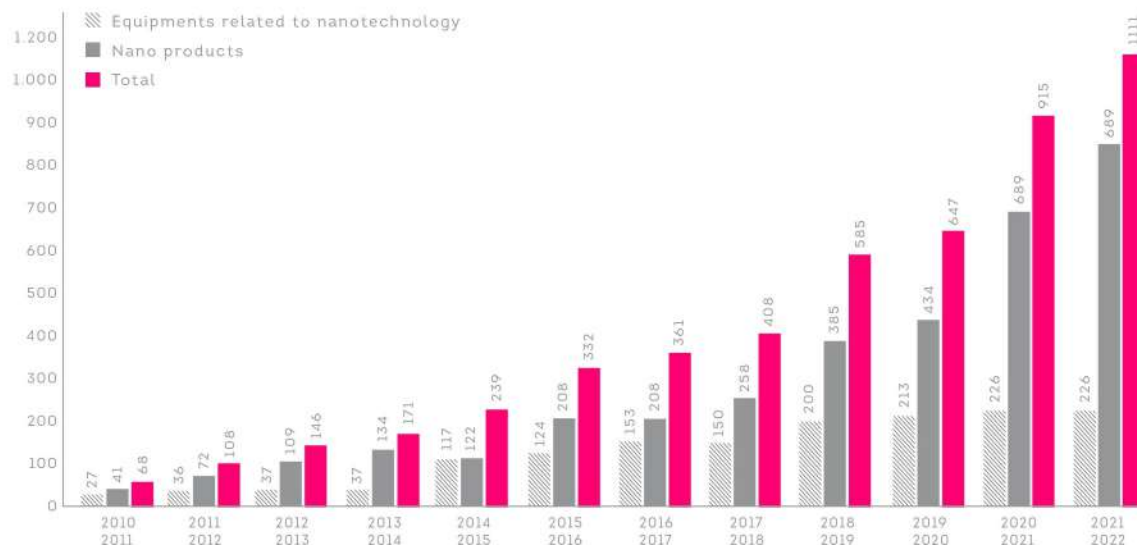
1. Nanotechnology or nanoscale scientific knowledge (1-100nm) is used in them.
2. The product applications and properties are improved by nanotechnology.
3. The product production process is based on engineering.

Products which are counted nanotechnology products according to standard ISO/TS8004 and the national standard 21145, are given nanoscale certificates after being assessed and examined with some related tests. Nanoscale certificates are issued with one-year validity which can be extended.

Moreover, during the validity of the certificate, periodic inspections are done to insure the product stability of scale and properties.

Nanoscale pilot(test) certificates are given to technologies and product which have just met some technical requirements but not the production and trade requirements existing in the institute bylaw such as product and utilization license, active quality control unit and other required licenses.

## The number of nanotechnology products and equipments





Statistics related to nanotechnology products and equipments which took nanoscale certificates until 20 June 2020.

### Total nano products and equipments

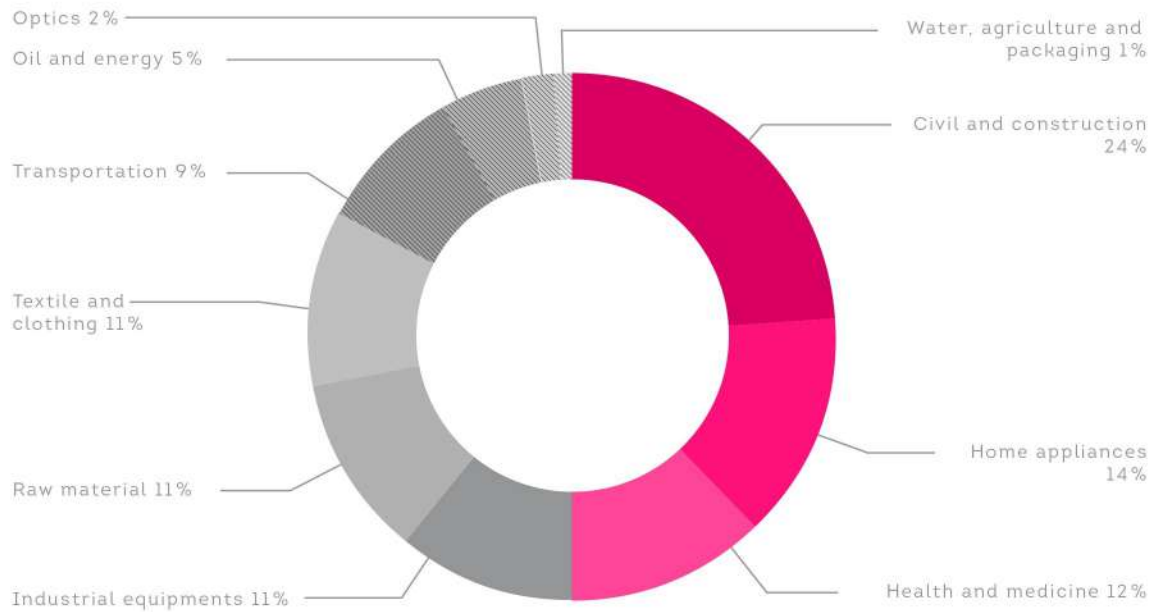


### Manufacturing companies of nano products and equipments



## Industrial domain of products having nanoscale certificates

### Industrial domain of products having nanoscale certificates



## The export target countries of Iran nano products in 2022

### **America**

Canada

United States

Bolivia

Brazil

Cuba

Paraguay

### **Oceania**

Australia

### **Europe**

Austria

Bulgaria

Croatia

England

Estonia

Finland

Georgia

Germany

Greece

Italy

Kosovo

Lithuania

### **Europe**

Netherlands

Poland

Portugal

Romania

Russia

Serbia

Spain

Sweden

Ukraine

Yugoslavia

Cyprus

Mongolia

**Asia**

Afghanistan

Armenia

Azerbaijan

Bangladesh

China

India

Iraq

Japan

Jordan

Kazakhstan

Kuwait

Kyrgyzstan

**Asia**

Lebanon

Malaysia

Oman

Pakistan

Qatar

South Korea

Syria

Tajikistan

Thailand

Turkey

Turkmenistan

United Arab Emirates

**Asia**

Uzbekistan

Singapore

Hong kong

**Africa**

Egypt

Kenya

South Africa

Tanzania

Mauritania

**PRODUCTS**

Transportation • • • • •  
Energy and Oil • • • • •  
and Related Industries • •

# ENERGY, OIL AND RELATED INDUSTRIES

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Nanocatalyst for Methanol Synthesis	1
Catalyst for Desulfurization from Natural Gas Flow	3
Alumina Catalyst	5
Low-Temperature Water-Gas Transfer Catalyst	7
Sulfur Recovery Catalyst	9
Refractory Casting Mass	11
Ceramic Gas Turbine Combustion Chamber	13
Power plant Air Filtration	15
Turbine Oil Purification Filter	17
Inflatable Retrievable Packer	19
Battery Expander	21





# NANOCATALYST FOR METHANOL SYNTHESIS

Sarv Oil & Gas

www.sarvco.ir

## Description

This product is a nanoparticle-reinforced composite catalyst with a disk form, enabling a profound enhancement in the methanol synthesis efficiency.

## Nanotechnology-driven advantages

the addition of nanoparticles to the commercial composite catalyst has resulted in:

- Increased activity of the catalyst

The experimental results of chromatography assay carried out to assess the catalytic properties of the nano sample are reported below:

Studied parameters/specimen type	Molar percent
Methanol content in the exhaust gas/control sample (MEGA MAX700)	10.24
Methanol content in the exhaust gas after 48 h/control sample (MEGA MAX700)	9.51
Methanol content in the exhaust gas/nano sample	10.01
Methanol content in the exhaust gas after 48 h/nano sample	9.58

## Applications

- Low-pressure and low-temperature methanol synthesis
- Fabrication of unleaded gasoline, formaldehyde, dimethyl ether, propylene, and other petrochemical products



# CATALYST FOR DESULFURIZATION FROM NATURAL GAS FLOW

Gostaresh Fanavari Kharazmi

www.kharazmi-rt.com

## Description

This product is a ceramic nanoparticle-containing adsorbent which can remove the sulfur-containing corrosive compounds from natural or synthetic gas in the petrochemical industry. It is a low-cost product, benefiting high reactivity.

## Nanotechnology-driven advantages

The incorporation of ceramic nanoparticles into the adsorbent has led to:

- Improved adsorption capacity
- Enhanced sulfur removal efficiency

The physical properties of the nano sample are outlined below:

Physical Properties		
Effective area (m <sup>2</sup> /g)	Control sample	25.94
	Nano sample	48.29
Sulfur absorbing capacity (g sulfur/g adsorbent)	Control sample	0.27
	Nano sample	0.31

## Applications

- Removal of sulfur from the methane gas in petrochemical and steel industries



# ALUMINA CATALYST

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Ardakan Industrial Ceramics Company (A.I.C)

[www.aic.ir](http://www.aic.ir)

## Description

This product is an iron-promoted active alumina catalyst used to remove H<sub>2</sub>S compound from fossil fuels. It is a deoxygenation catalyst with a high specific surface area, which can drastically diminish the oxygen content in the Claus process.

## Nanotechnology-driven advantages

Doping a metal element into the alumina catalyst has resulted in:

- Preventing the inactivation of the catalyst through decreasing the oxygen content

## Applications

- Production of natural gas and crude oil



# LOW - TEMPERATURE WATER-GAS TRANSFER CATALYST

Gostaresh Fanavari Kharazmi  
Naft & Gas Sarv

[www.kharazmi-rt.com](http://www.kharazmi-rt.com)

[www.sarvco.ir](http://www.sarvco.ir)

## Description

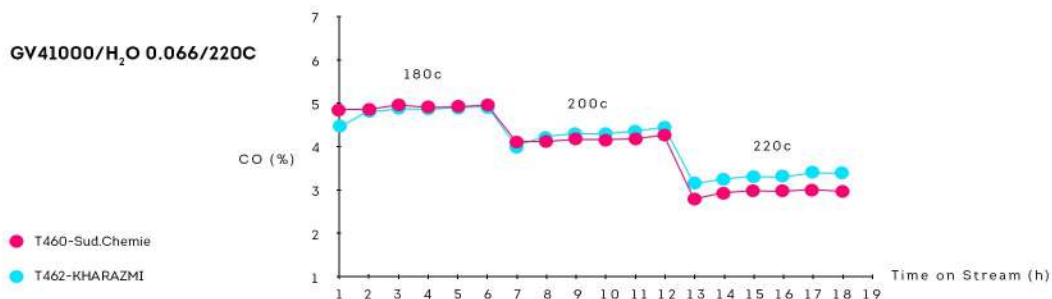
This product is a nanoparticle-modified copper catalyst, which is supplied in a disk shape with a high effective area. It can be used to reduce the amount of carbon monoxide present in the gas stream.

## Nanotechnology-driven advantages

The incorporation of nanoparticles into the copper catalyst has resulted in:

- Higher activity of the catalyst due to its higher surface area

The diagram showing the catalytic activity of the nano sample in comparison with that of an industrial counterpart (from Sud-chemie Company) is presented below:



## Applications

- Petrochemical complexes
- Oil refining companies





# SULFUR RECOVERY CATALYST

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Ardakan Industrial Ceramics Company (A.I.C)

[www.aic.ir](http://www.aic.ir)

## Description

This product is a sulfur recovery catalyst composed of spherical ceramic nanoparticles with a high specific surface area, benefiting favorable durability in acidic and oxidant media. It is used to convert COS and CS<sub>2</sub> compounds to H<sub>2</sub>S in the Claus process.

## Nanotechnology-driven advantages

The application of this nanostructured catalyst has given rise to:

- Increased efficiency in the Claus process

## Applications

- Natural gas companies
- Oil refining companies
- Coke factories



# REFRACTORY CASTING MASS

Pat Roshan Nikta Group

[www.patron.group](http://www.patron.group)

## Description

This product is a casting refractory based on ceramic materials in which nanoparticle-containing colloidal binder is used with an appropriate stability. It is able to efficiently bind the ceramic precursors to form final bulk refractory units and coatings.

## Nanotechnology-driven advantages

The addition of ceramic nanoparticles to the binder of this refractory has resulted in:

- Enhanced gelation properties
- Improved strength

The measured results for the compressive strength of the nano sample are reported below:

Specimens	Value in MPa (According to ASTM C150)
Control sample	43
Nano sample	117

## Applications

- Casting factories
- Petrochemical plants
- Steel Mills





# C E R A M I C   G A S   T U R B I N E C O M B U S T I O N   C H A M B E R

Atlasceram Kavir

www.atlasceram.ir

## Description

This product is a nanoparticle-reinforced ceramic combustion chamber, which is produced by the casting method. It benefits desirable corrosion properties and tolerates elevated pressure and temperature.

## Nanotechnology-driven advantages

The incorporation of nanoparticles into the ceramic matrix has resulted in:

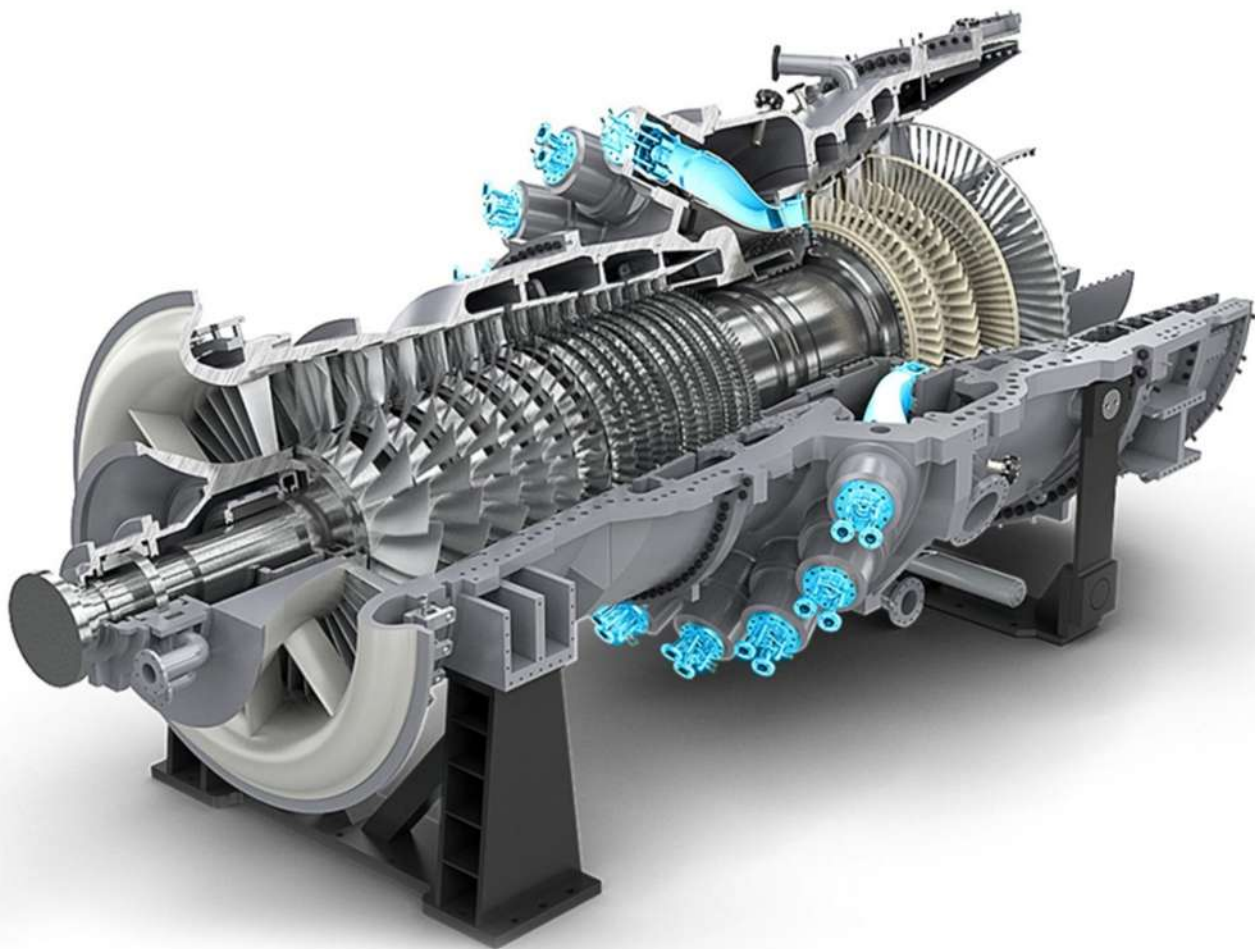
- Increased strength
- Improved thermal properties
- Dimensional accuracy

The practical results of the shock sensitivity test for the nano sample are reported below:

Crack length after thermal shock for 30 cycles (According to DGTLV-810335001)	Maximum length= 18 mm
	Average length= 12 mm

## Applications

- Gas turbines
- Ferrous and non-ferrous metals industries
- Power plants
- Helicopter engine
- Aircraft engine



# POWER PLANT AIR FILTRATION

Behran Filter

[www.behranfilter.com](http://www.behranfilter.com)

Azad Filter

[www.azadfilter.ir](http://www.azadfilter.ir)

## Description

While produced by two separate companies, this product is an efficient air filter based on a cellulose or synthetic textile which is coated by polymeric nanofibers.

## Nanotechnology-driven advantages

The coating of nanofibers on the cellulose or synthetic textile has given rise to:

- Improved filtration efficiency
- Prolonged working lifetime of the filter
- Increased dust absorption efficacy with no drop in pressure of passing air

The following table summarizes the filtration efficiency of the nano sample produced by both companies.

Specimens	Filtration efficiency of Behran filter	Filtration efficiency of Azad filter
Control sample	70%	47.7%
Nano sample	96%	73.17%

## Applications

- Air filtration of gas turbines
- Filtration of floating dust in the inlet air of facilities







# T U R B I N E O I L P U R I F I C A T I O N F I L T E R

Behin Palaye Sharif

www.a.farzadfar@gmail.com

## Description

This product is an eco-friendly cellulose nanofiber-modified depth filter, which is used to efficiently remove the varnish from a turbine oil. It benefits sufficient resistance to both organic solvents and weak acids, providing a high absorbing ability.

## Nanotechnology-driven advantages

The addition of nanofibers to the filter has led to:

- Improved ability in varnish removing
- Enhanced absorbing capability of contaminants

The measured results of membrane patch colorimetric (MPC) test revealing the varnish removing ability of the nano sample are reported below:

Specimens	$\Delta E$ (Color change variations)
Unfiltered oil	48.48
Filtered oil using control sample	19.07
Filtered oil using nano product	9.09

## Applications

- Removing the varnish from lubricant oils, hydraulic oils, gear oil, and transformer oil



# INFLATABLE RETRIEVABLE PACKER

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Kia Sanat Sharif

[www.spdc.sharif.ir](http://www.spdc.sharif.ir)

## Description

This product is an inflatable retrievable packer, consisting of nanoparticle-reinforced elastomers. It can operate with no need for removing a production string and provide a platform to send tools into a well.

## Nanotechnology-driven advantages

The incorporation of nanoparticles into the elastomer has given rise to:

- Higher corrosion resistance
- Improved elongation while maintaining strength
- Enhanced stability at elevated temperatures and pressures

## Applications

- Petrochemical applications
- Repairing, maintenance and stimulation of oil and gas wells



# BATTERY EXPANDER

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Nanoshimi Novin Iranian

[www.ncnico.ir](http://www.ncnico.ir)

## Description

This product is a nanoparticle-modified lead acid battery expander, providing a facilitated condition for electrons to transfer between the poles of the battery.

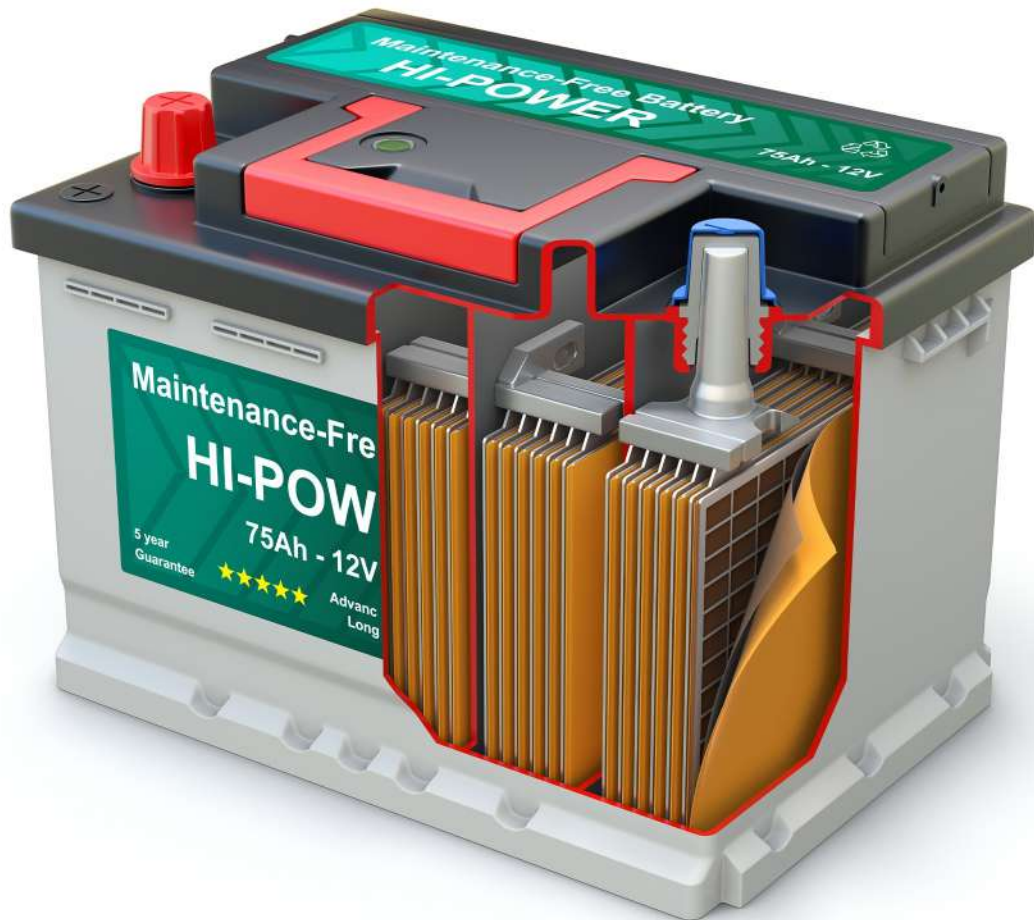
## Nanotechnology-driven advantages

The addition of nanoparticles to the battery expander has resulted in:

- Fast charge/discharge rate

## Applications

- Automotive battery



# TRANSPORTATION

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Heat-insulating and Sound-absorbing paint	23
Anti-corrosion paints containing nanoparticles	25
Skydrol-Resistant Paint with Modified Rheological Properties	27
Gloss Polyurethane Paint for Aviation industry	29
Automotive Air Filter	31
Automotive Catalyst	33
Antibacterial aircraft seat cover	35
Engine Oil	37
Air Filter for Heavy Trucks	39
Nanoparticles-Containing Electric Dough	41
Car Body Sealant	43
Paint shield for underside of cars	45
Reinforcing Adhesive for Car Body	47
Locomotive Air Filter	49
Antibacterial aircraft blanket fabric	51
Copper-Aluminum Rebar	53
Submerged Arc Welding Tip	
Spot Welding Electrode Tip	
Automotive Mirror with a Nanostructured Metal Coating	55





# HEAT-INSULATING AND SOUND-ABSORBING PAINT

Nilifam Rey

www.nilifam.com

## Description

This product is an acrylic resin-based paint with a high capability of insulating the heat and absorbing the acoustic waves within the range of 400-1000 Hz. Applying a limited thickness of the paint on any substrate can influentially attenuate the disturbing sounds in the surrounding environment.

## Nanotechnology-driven advantages

The exploitation of nanoparticles in the paint formulation has resulted in:

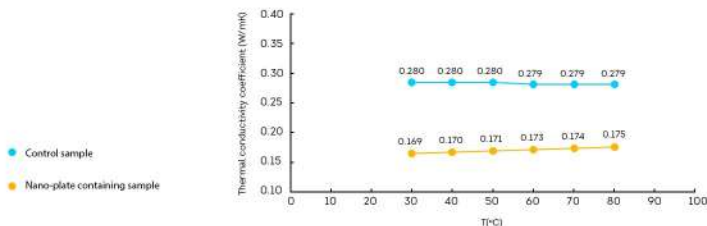
- Suppressing the heat transfer and reflection
- Persuading the deviation of acoustic waves

The experimental results corresponding to the sound attenuation and heat insulation tests for the nanoparticle-included paint and nanoparticle-depleted one are reported below:

Sound attenuation test:

Properties	Control sample	Nano sample
Acoustic attenuation at the frequency of 1000 Hz (db)	38.7	46.3
Acoustic attenuation at the frequency of 440 Hz (db)	21.3	23.2

Heat insulation test:



## Applications

- Apartments and residential buildings equipment
- Pipes
- Thermal chimneys
- Wagons, aircrafts, ships and construction equipment.



# ANTI-CORROSION PAINTS CONTAINING NANOPARTICLES

Kimia Qom

www.nanoproduct.ir

## Description

This product is a polymer paint enhanced by nanoparticles, through which some operational considerations and improved corrosion properties are enhanced.

## Nanotechnology-driven advantages

The addition of nanoparticles to the polymer matrix has led to some improvements:

- Better corrosion resistance
- Ease of use
- Stronger adhesion to the substrate

The polarization resistance ( $R_p$ ) values of the control sample and nano sample are outlined in the following table:

Specimens	$R_p$ after 7 days ( $\Omega$ )
Control sample	3685
Nano sample	16423

## Applications

- Building structures
- Steel structures in the oil, gas, and petrochemical industries
- Bridges
- Power stations
- Factories





# SKYDROL-RESISTANT PAINT WITH MODIFIED RHEOLOGICAL PROPERTIES

Goharfam Industrial Manufacturing Co.

[www.goharfam.com](http://www.goharfam.com)

## Description

This product is a polymeric paint modified by nanoparticles with a high chemical resistance. Its density is  $1.1 \text{ g cm}^{-3}$  and can resist against the UV radiation for at least 300 hours.

## Nanotechnology-driven advantages

The incorporation of nanoparticles into the polymeric paint has resulted in:

- Higher viscosity
- Enhanced sagging resistance

The measured results of the viscosity test for the nano sample and control sample are shown in the following table:

Test type (according to ASTM D4400)	Control sample	Nano sample
Viscosity Krebs [KU]	113	120
Viscosity ford cup [s]	276	451

## Applications

- Finishing paint for facilities and cabin of the aircrafts





# GLOSS POLYURETHANE PAINT FOR AVIATION INDUSTRY

Giti Asa Industrial and Chemical Manufacturer Co.

[www.gitiassa.com](http://www.gitiassa.com)

## Description

This product is a nanoparticle-reinforced polyurethane paint with a short drying time, high chemical stability, and sufficient resistance to UV radiation for the aviation industry.

## Nanotechnology-driven advantages

The addition of nanoparticles to polyurethane matrix has led to:

- Higher flexibility
- Enhanced mechanical properties
- Stronger adherence to the underlying substrate

The practical results of the anti-sagging and viscosity tests have been given below:

Measured viscosity		
Anti-sagging thickness	Control sample	No resistance
	Nano sample	125 $\mu\text{m}$
Viscosity ford cup [s]	Control sample	186
	Nano sample	386

## Applications

- Finishing paint for facilities and cabin of the aircrafts







# AUTOMOTIVE AIR FILTER

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Nano Sakhtar Mehr Asa

[www.nanofilter.ir](http://www.nanofilter.ir)

Behran Filter

[www.behranfilter.com](http://www.behranfilter.com)

Fara Negar Shargh

[www.fardafilter.ir](http://www.fardafilter.ir)

Azad Filter

[www.azadfilter.ir](http://www.azadfilter.ir)

## Description

This product is an automotive particulate-absorbing air filter coated by a thin layer of electrospun nanofibrous polymeric web to improve its filtration efficiency.

## Nanotechnology-driven advantages

The covering of the surface of the fabricated air filter with certain nanofibers has led to:

- Improvement in particulate absorption efficiency

## Applications

- Automotive Air Filtration



# AUTOMOTIVE CATALYST

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Iran Delco

[www.irandelco.com](http://www.irandelco.com)

Partofarazan Avizheh Kimia

[www.parto-farazan.com](http://www.parto-farazan.com)

## Description

While reducing the emission of gasoline and diesel cars, this product is a catalytic converter containing precious metals-based nanoparticles such as platinum, rhodium, and palladium to improve its catalytic performance. It has passed Euro 4 standards.

## Nanotechnology-driven advantages

The presence of precious metals-based nanoparticles in the fabricated catalytic converter:

- Enhances the thermal stability
- Improves the interlayer adhesion
- Prevents the agglomeration of the particles in the slurry used
- Increases the catalytic performance due to the reduction in light-off

## Applications

- Catalytic converter for passenger cars and vans



# A N T I B A C T E R I A L AIRCRAFT SEAT COVER

Tiz Tak

www.tiztakco.com

## Description

This product is an antibacterial flame-retardant nanoparticle-containing fabric for the fabrication of aircraft seat cover to prevent the transmission and growth of pathogenic bacteria, fungi, and microorganisms.

## Nanotechnology-driven advantages

The inclusion of nanoparticles in the fabric has brought about:

- Emergence of durable antibacterial property

The antibacterial performance of the nanoparticle-containing fabric is reported as below:

Specimens	Antibacterial activity
Acceptable standard limit	2
Nano sample (S. Aureus)	2.07
Nano sample (E. Coli)	2.0

## Applications

- Aircraft seat cover



# ENGINE OIL

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Pardis Chimistry Bakhtar

[www.psb-oil.com](http://www.psb-oil.com)

## Description

This product is an engine oil in which a nanoscale additive is included to protect the engine, extend its lifetime, facilitate starting and turning off the vehicle, and lower down the fuel consumption.

## Nanotechnology-driven advantages

The following improvements have been made through adding hard nanoparticles in the engine oil as a stable suspension:

- Filling the pores in the interior surfaces of engine and providing a better lubrication
- Supplying favorable lubrication and reducing heat generation and wear in engine

## Applications

- Engine oil for a variety of vehicles





# A I R F I L T E R F O R H E A V Y T R U C K S

Behran Filter

[www.behranfilter.com](http://www.behranfilter.com)

## Description

This product is a dust-absorbing air filter covered by a thin layer of nanofibrous polymeric web to improve its filtration efficiency and prolong its operational lifespan.

## Nanotechnology-driven advantages

The covering of the surface of the fabricated air filter with certain nanofibers has led to:

- Improvement in filter efficiency and floating dust absorption
- Longer operational lifespan

The filtration efficiency of the nano sample has been measured and its results are reported below:

Specimens (National standard ISIRI 34)	Filtration efficiency
Control Sample	40%
Nano Sample	89%

## Applications

- Air filtration for heavy trucks



MIRAL  
LX 2059  
MADE IN GERMANY

# NANOPARTICLES CONTAINING ELECTRIC DOUGH

Yasin Shimi Ghoghous

[www.nanoproduct.ir](http://www.nanoproduct.ir)

## Description

This product is an electrically conductive dough in which metallic nanoparticles made of heavy nonferrous precious metals are uniformly dispersed. It bears a low electrical resistance and serve as deformable joints for electronic circuits.

## Nanotechnology-driven advantages

The uniform dispersion of conductive metal nanoparticles throughout the dough has resulted in:

- Reduced electrical resistance
- Enhanced current transfer efficiency

The following table reports the electrical resistivity test results for the nano sample:

Specimens	SpeciElectrical resistivity ( $\mu\Omega/\text{sq}$ )
Control sample	68.4
Nano sample	32.2

## Applications

- Heater circuit on the rear windshield of vehicles



# CAR BODY SEALANT

Goharfam Industrial Manufacturing Company

[www.goharfammgf.com](http://www.goharfammgf.com)

## Description

This product is a polymeric sealer with no solvent to seal the seams and distances left between the joints in the body and inside a car. It is able to avoid the penetration of water, dust, and gas inside the car room and withstand the friction and vibration during the vehicle movement.

## Nanotechnology-driven advantages

The utilization of nanoparticles inside the polymeric matrix has resulted in:

- Increasing the viscosity of the sealer
- Improving the sagging resistance
- Enhancing the shear strength of the sealer

The viscosity and sagging resistance of the nano sample have been measured and their results are reported below:

Measured properties		
Daniel Flow Gauge [cm]	Control sample	6
	Nano sample	1
Viscosity [Pa.s]	Control sample	40
	Nano sample	130

## Applications

- Sealing the body of vehicles
- Connecting the panels before the welding
- The interior parts of a car room



# P A I N T   S H I E L D   F O R U N D E R S I D E   O F   C A R S

Goharfam Industrial Manufacturing Company

[www.goharfammgf.com](http://www.goharfammgf.com)

## Description

This product is a polymeric shielding paint composed of polymeric matrix and nanoparticles to protect the underside of cars against the environmental corrosive and detrimental agents for a long time. It can also attenuate the disturbing sounds during the vehicle movement.

## Nanotechnology-driven advantages

The utilization of nanoparticles inside the polymeric matrix of the shield paint has resulted in:

- Making the paint anti-corrosive, impact-resistant, pebble endurance, and wear-resistant
- Increasing the viscosity of the paint
- Enhancing the shear strength of the paint
- Enhancing the adhesion to steel surfaces
- Favorable damping capacity

The viscosity and shear resistance of the nano sample have been measured and their results are reported below:

Measured properties		
Shear strength [MPa]	Control sample	Not measured due to low viscosity
	Nano sample	1.58
Viscosity [Pa.s]	Control sample	17
	Nano sample	90

## Applications

- Underside of vehicle chassis
- Underside of mudguard, rear, front bumper, and door frames of cars
- Interior parts of vehicles that are not physically accessible, but are highly prone to corrosion, such as panels, frame rails, and inner cavities





# REINFORCING ADHESIVE FOR CAR BODY

Ayegh Khodro Toos

[www.aktcom.ir](http://www.aktcom.ir)

## Description

This product is an epoxy resin-based and solvent-free reinforcing adhesive containing nanoparticles. It should be cured at temperatures above 140 °C to be resistant against moisture, heat, extreme cold, and acidic and alkaline media.

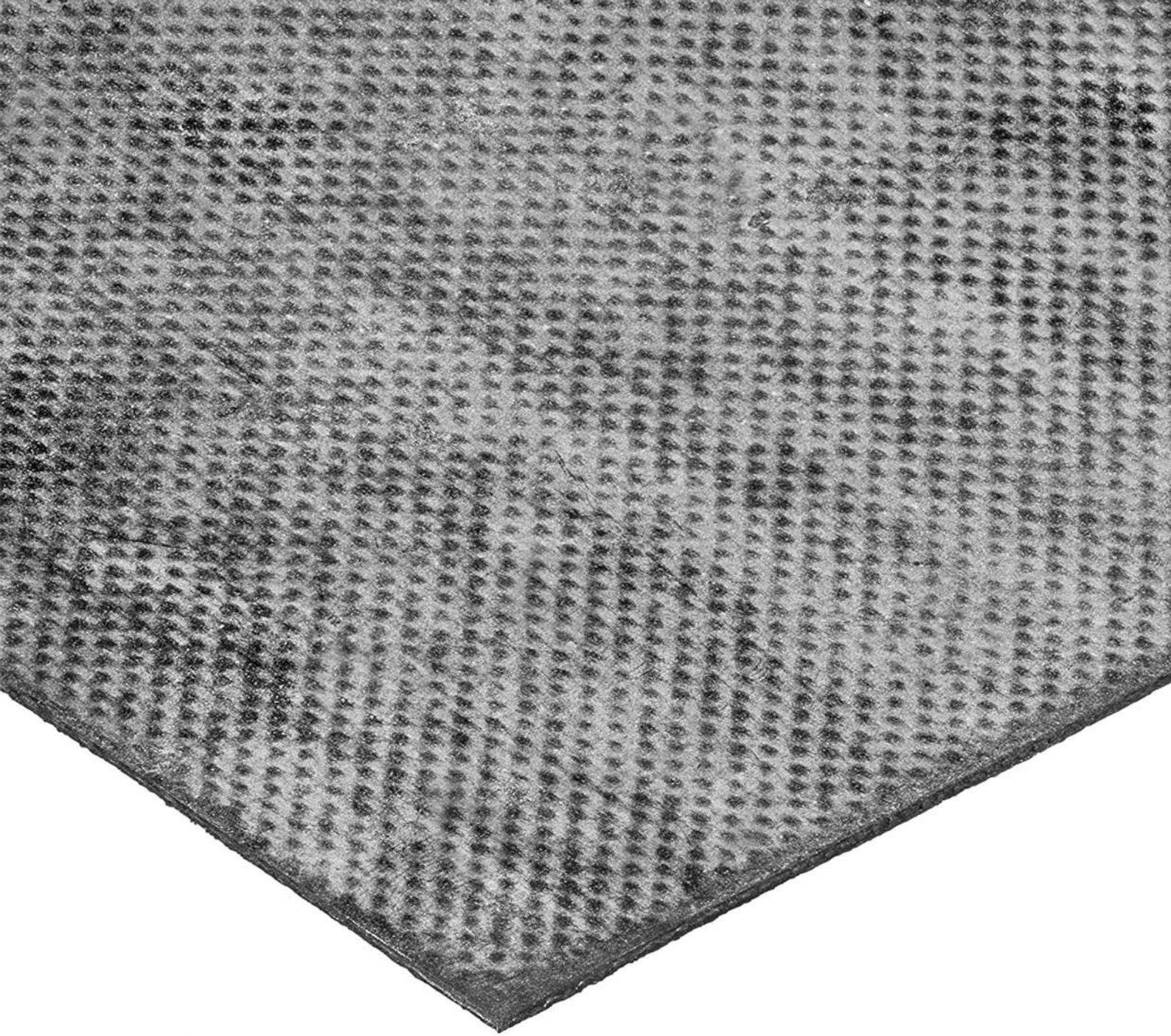
## Nanotechnology-driven advantages

The incorporation of nanoparticles in the epoxy resin matrix has resulted in:

- Improved flowability, adhesion strength, and heat flux
- Enhanced wear resistance in a convenient and cost-effective way

## Applications

- Reinforcing adhesive for ceilings, doors, columns, and backs



# LOCOMOTIVE AIR FILTER

Azad Filter

[www.azadfilter.ir](http://www.azadfilter.ir)

## Description

This product is a dust-absorbing air filter covered by a thin layer of electrospun nanofibrous polymeric web to improve its filtration efficiency in locomotives. It provides highest dust absorption capacity and lowest pressure drop in the passing air flow, what is critical for locomotive engines.

## Nanotechnology-driven advantages

The covering of the surface of the fabricated air filter with certain nanofibers has led to:

- Improved filter efficiency
- Increased dust absorption capacity

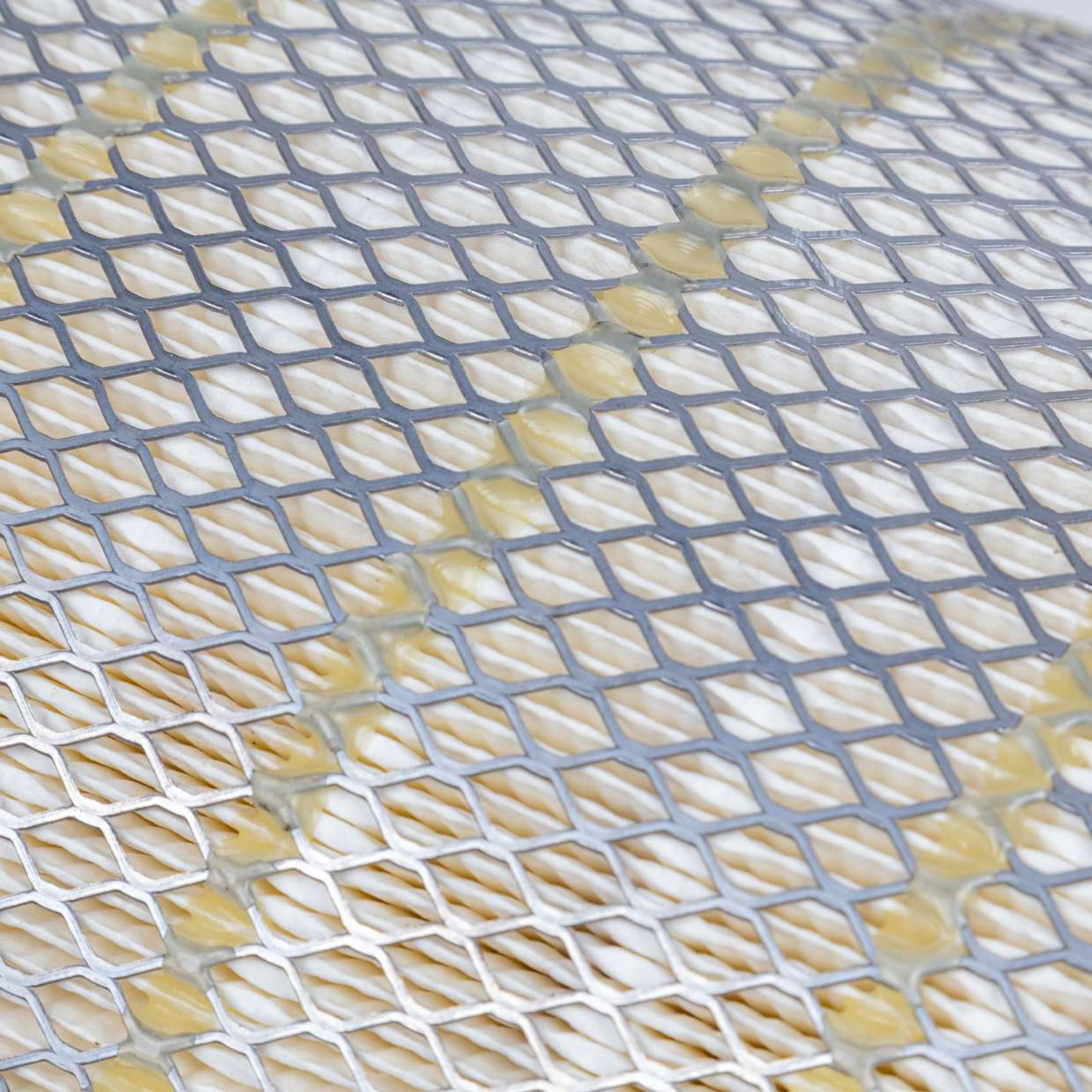
The filtration efficiency of the nano sample has been evaluated and its result is reported below:

Specimens	Filtration Efficiency
Nano sample	85.65%
Control sample	59.39%

## Applications

- Air Filtration for locomotive engines





# A N T I B A C T E R I A L AIRCRAFT BLANKET FABRIC

Zarba Amin Textile Industries Co.

[www.zarbaamin.com](http://www.zarbaamin.com)

## Description

This product is an antibacterial aircraft blanket made of polyester and acrylic fabrics containing nanoparticles to kill bacteria and microbes.

## Nanotechnology-driven advantages

The incorporation of nanoparticles into the fabric is responsible for:

- Emergence of antibacterial properties

The antibacterial activity results of the nanoparticles-containing fabric are reported below:

Specimens (According to INSO 11070)	Antibacterial activity after washing for 10 times	Antibacterial activity before washing
Acceptable standard limit	2	2
Control sample	0	0
Nano sample (S. Aureus)	2.63	2.81
Nano sample (E. Coli)	2.25	2.51

## Applications

- Antibacterial blanket for airplanes



# COPPER - ALUMINUM REBAR SUBMERGED ARC WELDING TIP SPOT WELDING ELECTRODE TIP

Artash Composite

www.artashcomposite.com

## Description

The first product is a well-engineered rebar based on pure copper whose hardness and mechanical strength are enhanced by dispersing alumina nanoparticles. It can be used as spot welding electrode tip and submerged arc welding electrode with low cost and prolonged lifetime.

## Nanotechnology-driven advantages

The exploitation of spherical nanoparticles in The uniform dispersion of alumina nanoparticles inside the copper matrix has resulted in a non-toxic matrix has resulted in favorable efficiency on the mice due to:

Specimens (According to ISO 5182)	Hardness(HRB)	Electrical Conductivity (%IACS)
Acceptable standard limit	82	76
Control sample	39	101.4
Nano sample	85	80.57

## Applications

- Production of resistance welding electrodes
- Submerged arc welding tips
- CO2 welding tips
- Welding of pipes for oil and gas industry in a huge volume





# AUTOMOTIVE MIRROR WITH A NANOSTRUCTURED METAL COATING

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Quzh Abgin Mobin

[www.quzh.ir](http://www.quzh.ir)

## Description

This product is an automotive mirror coated by a nanostructured metallic film to improve its resistance to erosion and humidity, and decrease the reflected light while image resolution remains unaffected.

## Nanotechnology-driven advantages

The deposition of a nanostructured metal film on the fabricated automotive mirror gives rise to:

- Higher durability
- Improved resistance to erosion and humidity
- Reduction in reflected light while image resolution remains unaffected

## Applications

- Car mirror for driving at night

