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**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 •**

Medicine and Health, Water, Agriculture and Packaging






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:

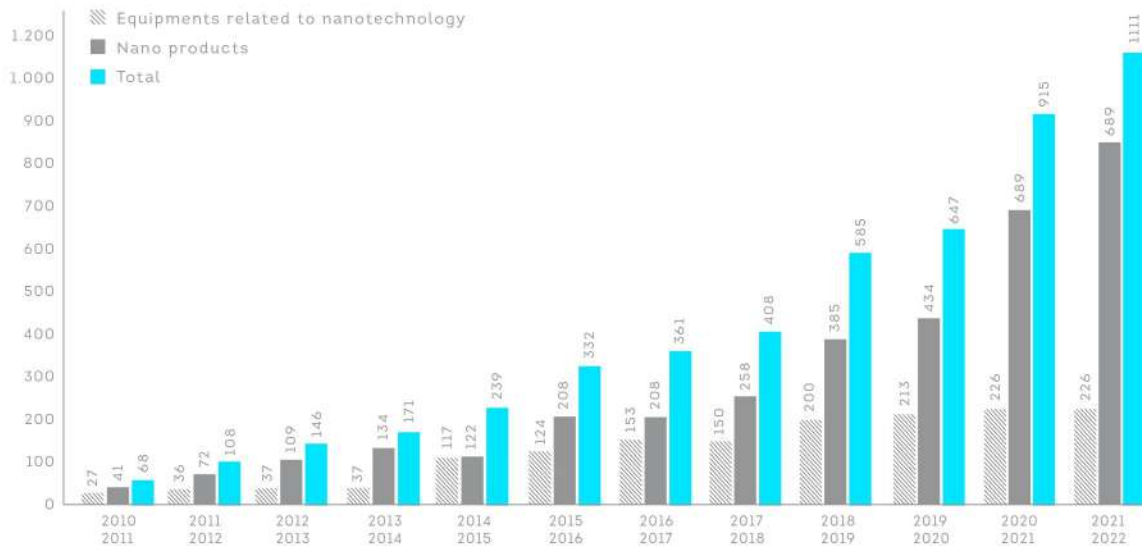
1. Nanotechnology or nanoscale scientific knowledge (1-100nm) is used in them.
2. The product applications and properties are improved by nanotechnology.
3. The product production process is based on engineering.

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

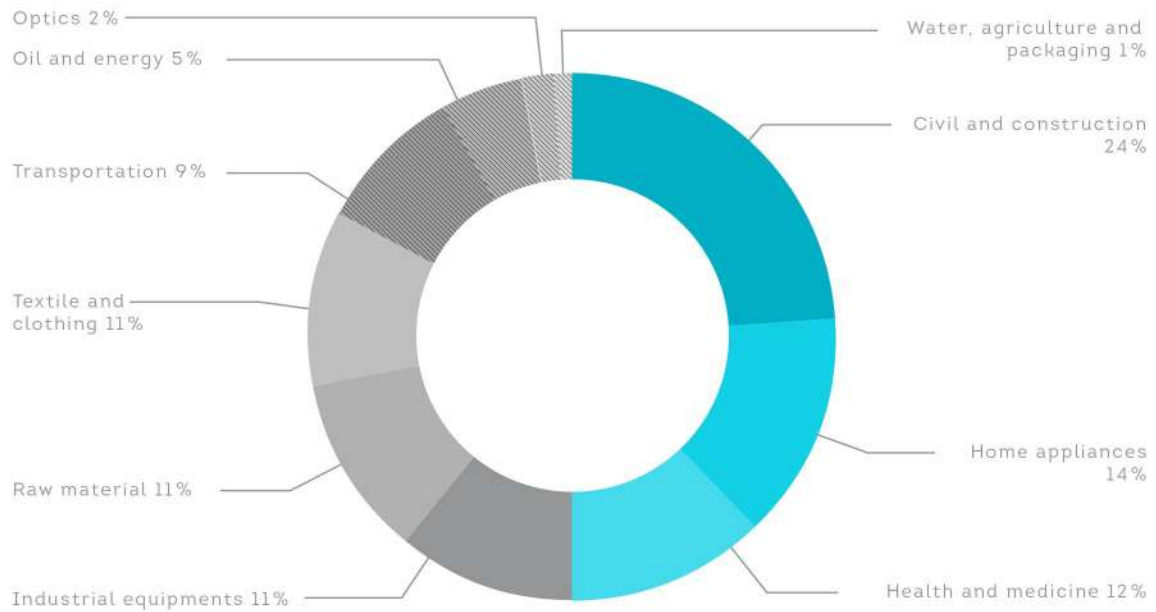


Manufacturing companies of nano products and equipments



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

P R O D U C T S

Medicine • • • • • • •

Health • • • • • • •

Water • • • • • • •

Agriculture • • • • • • •

Packaging • • • • • • •

MEDICINE AND HEALTH

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Oil-Free Sun-Screen Cream with SPF: 50	19
Chemical-Free Sun-Screen Cream with SPF: 30	
Chemical-free Sun-Screen Cream with SPF: 46	
Chemical-free Sun-Screen Cream for Dry and Sensitive Skins with SPF: 60	
Tinted Sun-Screen Cream with SPF: 90	

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A L B U M I N - B O N D E D P A C L I T A X E L

Nano Daroo Pazhuhan Pardis

www.nanodaru.com

Description

This product is an albumin-bound paclitaxel and can be typically used for the treatment of different cancers such as the breast, pancreatic, ovarian and lung cancers. This drug is an efficient natural anti-cancer agent inhibiting the growth of cancer cells and has no side effects unlike other solvent-based chemotherapy counterparts.

Nanotechnology-driven advantages

The addition of albumin nanocarrier to the paclitaxel has led to:

- Higher anti-cancer efficiency
- Considerable penetration of nanocarriers into the tumor tissue

Applications

- Cancer treatment such as breast, pancreatic, ovarian, and lung cancers



ANTI-CANCER DRUG

Exir Nano Sina

www.exirnanosina.ir

Description

This product, called SinaDoxosome, is a cancer treatment drug composed of liposomal hydrochloride doxorubicin, in which the doxorubicin is inserted into a nanoliposome carriers. The product is highly influential in the destruction of cancer cells, reducing their size, and retarding the tumor growth.

Nanotechnology-driven advantages

Loading the drug inside the liposomal nanocarrier has led to:

- Increasing the permeability and stability of the drug
- Alleviating the side effects of the drug

Applications

Systematic treatment of:

- Metastatic breast cancer
- Advanced ovarian cancer
- Multiple myeloma
- AIDS-related Kaposi sarcoma



SinaDoxosome

Doxorubicin HCl

Liposome Injection 20 mg/10 ml
(2 mg/ml, single use vial)

Take this preparation only under medical supervision.

Store at 2-8°C. Avoid freezing.

Manufacturing Authorization Holder:

Exir Nano Sina, Tehran-Iran

Manufacturer: Sobhan Oncology Co.

Rasht, Iran



C U R C U M I N N A N O M I C E L L E C A P S U L E

Exir Nano Sina

www.exirnanosina.ir

Description

This product is a curcumin-loaded nano-micelle, enabling the insoluble curcumin to be distributed and dissolved in the water so that the body can easily adsorb it. Curcumin benefits from anti-inflammatory, anti-oxidant, and anti-cancer properties.

Nanotechnology-driven advantages

The use of nano-micelles as drug carrier has resulted in:

- Higher adsorption of curcumin in the body
- Better performance of curcumin

Applications

- Improving liver and digestive system function
- Adjunctive therapy for diabetes
- Repair of damaged tissue
- Reducing the side effects of chemotherapy
- Preventing the formation of clots in the vessels
- Treatment of Alzheimer's and Parkinson's disease
- Cholesterol lowering



TOPICAL GEL FOR CUTANEOUS LEISHMANIASIS TREATMENT

Exir Nano Sina

www.exirnanosina.ir

Description

This product is a topical gel based on the nanoliposome technology and its main component is a polyene anti-parasitic and anti-fungal drug. This gel can be typically used for treating the Cutaneous Leishmaniasis and benefits from trivial side effects and lower cost.

Nanotechnology-driven advantages

The encapsulation of the main drug by the nanoliposomal structures has led to:

- Promoting the drug penetration into the affected tissue
- Reducing the detrimental side effects of the drug on the body

Applications

- Treatment of cutaneous leishmaniasis
- Treatment of topical fungal diseases



FAMILY OF DRUG DETECTION KITS

Zist Abzar Pazhuan

www.zistabzar.com

Description

These products are different types of diagnostic kits in which the metal nanoparticles are bound to the detecting antibodies, mounting on a release pad. Each kit possesses an especial antibody. They are rapid drug detection kits based on the competitive method and their test results can be checked quickly after 3 minutes with the following cut-offs.

Drug's name	Cut Off (ng/ml)
Amphetamine	500
Methamphetamine	500
Methadone	300
Morphine	300
Hashish	50

Nanotechnology-driven advantages

The utilization of metal nanoparticles:

- Is required to bind the desired antibodies and pave the way for the analyte detection.
- Increases the selectivity and high-resolution identification of drugs.

Applications

Rapid and simultaneous detection of:

- Morphine
- Amphetamine
- Methamphetamine
- Methadone
- Hashish
- Cannabis drugs



RAPID PREGNANCY DIAGNOSIS KIT

Zist Abzar Pazhuhan

www.zistabzar.com

Description

This product is a rapid diagnostic pregnancy kit containing metal nanoparticles. The used nanoparticles are typically bound to the antibodies to evaluate the release level of HCG hormone and determine if the person is pregnant.

Nanotechnology-driven advantages

The application of metal nanoparticles in the detection pregnancy kit:

- Increases the diagnosis precision.
- Is required to bind the desired antibodies and pave the way for the HCG hormone detection.

Applications

- Rapid detection of pregnancy





FAMILY OF ANTIBACTERIAL DISINFECTANT SOLUTIONS

Keyfiat Toulid Takapo

www.chitotech.com

Description

These products are a family of disinfectant solutions containing different concentrations of silver nanoparticles as an antibacterial agent. Here is a list of these products:

- Wound disinfectant
- Disinfectant solution suitable for the burning injury
- Hand sanitizer
- Disinfectant solution for Injection site
- Disinfectant solution for rinsing tools and instruments
- Disinfectant solution for rinsing surfaces and floors
- Disinfectant solution for mouthwash
- Disinfectant solution for car first aid kit
- Disinfectant solution for advanced first aid kit
- Disinfectant solution for portable first aid kit
- Hand sanitizer foam

Nanotechnology-driven advantages

The addition of silver nanoparticles to the solution in different concentrations has led to:

- Stronger antibacterial activity

Applications

- Disinfection of home appliances
- Wound disinfection
- Disinfection of burning injuries
- Disinfectant solution for first aid kit
- Disinfectant solution for mouthwash
- Rinsing and disinfection of tools and instruments
- Hand sanitizer
- Disinfection of Injection sites
- Disinfection of surfaces and floors



CHEMICAL FREE SUN SCREEN CREAM FOR KIDS WITH SPF: 30

Pars Hayan

www.parshayan

Description

This product is an oxide nanoparticle-containing sunscreen cream, enabling a strong protection against the harmful ultraviolet radiation. Additionally, it is fortified with vitamins C, E and panthenol, which are essential for the neutralization of free radicals and sufficient retention of skin moisture and elasticity.

Nanotechnology-driven advantages

The addition of oxide nanoparticles to the sunscreen has led to:

- Higher absorbance of harmful light rays

The measured results for the solar protection factor (SPF) of the control sample (i.e. the cream made from micron-sized particles) and nano sample (i.e. the cream made from nanoparticles) are given below:

	Control sample	Nano sample
SPF	11.39	38.95

Applications

- Protection of oily skin
- Acne treatment





ANTI WRINKLE & SUN SCREEN EYE CREAM WITH SPF: 30

CHEMICAL ADSORBENT FREE SUN SCREEN CREAM WITH SPF: 50

Pars Hayan

www.parshayan.com

Description

These two products are oxide nanoparticle-containing sunscreen creams, being founded on the natural organic reflective materials fortified with vitamin C, vitamin E, and green tea extract. They are supplied in two different types, anti-wrinkle sunscreen cream and chemical adsorbent-free sun-screen cream.

Nanotechnology-driven advantages

The incorporation of oxide nanoparticles into the sunscreen cream has resulted in:

- Higher absorbance of harmful light rays

The measured results for the solar protection factor (SPF) of the control sample (i.e. the cream made from micrometric particles) and nano sample (i.e. the cream made from nanoparticles) are reported below:

Anti-wrinkle sunscreen cream

	Control sample	Nano sample
SPF	13.29	32.82

Chemical adsorbent-free sunscreen cream

	Control sample	Nano sample
SPF	9.41	50.63

Applications

- Protection of sensitive skins from the harmful sun rays





OIL FREE SUN SCREEN CREAM WITH SPF: 50

CHEMICAL FREE SUN SCREEN CREAM WITH SPF: 30

CHEMICAL FREE SUN SCREEN CREAM WITH SPF: 46

CHEMICAL FREE SUN SCREEN CREAM FOR DRY AND SENSITIVE SKINS WITH SPF: 60

TINTED SUN SCREEN CREAM WITH SPF: 90

Pars Hayan

www.parshayan

Description

These products are oxide nanoparticles-containing herbal sunscreen creams with a wide variety of solar protection factors (SPF). No chemical adsorbents are used in their chemical composition with no allergic concern for the users.

Nanotechnology-driven advantages

The addition of oxide nanoparticles to the sunscreen creams has resulted in:

- Higher absorbance of harmful lights

The measured results for the solar protection factor (SPF) of the control sample (i.e. the cream made from micrometric particles) and nano sample (i.e. the cream made from nanoparticles) are reported below:

Oil-free sunscreen cream

	Control sample	Nano sample
SPF	38.41	58.06

Chemical-free Sun-Screen Cream with SPF: 46

	Control sample	Nano sample
SPF	12.09	49.26

Chemical-free Sun-Screen Cream for Dry and Sensitive Skins with SPF: 60

	Control sample	Nano sample
SPF	79.28	91.45

Chemical-Free Sun-Screen Cream with SPF: 30

	Control sample	Nano sample
SPF	9.9	30.17

Tinted Sun-Screen Cream with SPF: 90

	Control sample	Nano sample
SPF	7.31	60.33

Applications

- Protection of oily skins
- Acne treatment



HERBAL SUN SCREEN CREAM WITH SPF: 30

HERBAL SUN SCREEN CREAM WITH SPF: 60

Pars Hayan

www.parshayan

Description

These products are oxide nanoparticle-containing herbal sunscreen creams in which no chemical adsorbents are used. This is the reason why no harmful effects are observed on pregnant women and children.

Nanotechnology-driven advantages

The inclusion of oxide nanoparticles in the sunscreens has led to:

- Higher absorbance of harmful light rays

The measured results for the solar protection factor (SPF) of the control sample (i.e. the cream made from micrometric particles) and nano sample (i.e. the cream made from nanoparticles) are reported below:

Product 1: Herbal Sun-Screen Cream with SPF: 30

	Control sample	Nano sample
SPF	11.33	31.69

Product 2: Herbal Sun-Screen Cream with SPF: 60

	Control sample	Nano sample
SPF	5.34	63.62

Applications

- Sensitive skins
- Pregnant women





RESPIRATORY MASK

Fanavaran Nano Meghyas

Nano Tar Pak

Oxin Sabz Spadan

Nano Fanavaran Khavar

Imen Mask Azar

Zist Abzar Pazhuhan

www.fnm.ir

www.masknano.com

www.nanoxinco.com

www.nanokhavar.com

www.imenmaskazar.com

www.zistabzar.com

Description

This product is a respiratory mask containing nanometric fibers, enabling the filtration of floating solid particles up to 0.3 micrometers.

Nanotechnology-driven advantages

The application of nanofibers in the mask has resulted in:

- Improving the protection efficiency of the mask against various types of pollutants
- Increasing the absorption rate of fine-grained aerosol particles

The filtering efficiency percentage of the nanofibers-containing mask for the floating solid particles of different sizes is reported in the following table:

Particle size (μm)	E f f i c i e n c y (%)	
	Control sample	Nano sample
0.3	39	99
0.5	54	99
1	67	100
2.5	82	100
5	89	100
10	98	100

Applications

- Offering the sufficient protection against the polluted air
- Offering the protection against dusts and aerogels in industrial environments
- Giving the protection against allergens (up to 300 nm in size)
- Offering the protection for the respiratory system against the pulmonary infections and respiratory diseases



ANTIBACTERIAL SILICONE FOOT INSOLE, MAGNETIC MASSAGE SHOE INSOLE, AND GEL HEEL PAD

Amin Soat

www.pabepa-co.ir

Description

The first product is an antibacterial silicon shoe insole containing metallic nanoparticles to inhibit the growth of bacteria and fungi. The second product is a soft gel heel pad anatomically positioned at the heel to relieve pain and fatigue. The third product is an antibacterial magnetic massage shoe insole in which magnets are located in certain points to provide massaging effects.

Nanotechnology-driven advantages

The following functional improvements have been made through adding silicon and metallic nanoparticles to the polymer matrix:

- Emergence of antimicrobial and antifungal behavior in different climates
- Deodorization and providing non-allergic footwear
- Lifetime durability

Applications

- Antibacterial shoe Insoles
- Soft gel heel pads
- Magnetic massage foot Insoles



ANTIBACTERIAL I N S O L E

Pamouk Taban

www.pamooktaban.com

Description

This product is an antibacterial shoe insole composed of medical leather and certain nanoparticles to provide a very soft surface.

Nanotechnology-driven advantages

The incorporation of nanoparticles into the medical leather has resulted in:

- Emergence of antimicrobial and anti-allergic activities
- Ability to control the moisture, odor and bacteria growth

The antibacterial activity results are reported below:

Specimens	Antibacterial Activity (According to ISIRI 10900)
Acceptable standard level	2
Control sample	0
Nano sample (against E.coli)	2.11
Nano sample (against S. Aureus)	2.2

Applications

- Antibacterial shoe Insoles



HOOKAH FILTER

Hakiman Dourandish Pars

www.nanofil.org

Description

This product is a water-pipe nanofilter containing metal and metal oxide nanoparticles to reduce harmful substances in tobacco smoke. It can be used as hookah mouthpiece, aiming to absorb toxic and carcinogenic compounds.

Nanotechnology-driven advantages

The practical analysis of non-filtered and nano-filtered hookah smokes at the Iranian Tobacco Research Center has confirmed a significant reduction in harmful substances as shown in the table below:

Specimens	Condensates (mg/10 gr)	Humidity (mg/10 gr)	Nicotine (mg/10 gr)	Tar (mg/10 gr)
Non-filtered sample	3110.5	2343.8	3.02	763.6
Nanofiltered sample	2101.3	1895.9	2.07	197.8

Applications

- Tobacco smoke filters
- Hookah mouthpiece





WATER, AGRICULTURE AND PACKAGING

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CERAMIC ULTRA FILTER FOR PREPARATION OF WHEY CONCENTRATE

Danesh Pajouhan Sanat Nano

www.dpsn.co.ir

Description

This product is a cylindrical multi-layer module composed of several porous ceramic filters of pore size less than 10 nm for removing different components especially casein from whey. Molecular weight cut-off (MWCO) and water permeation rate of this product are 1500 g/mole and 20 L/m²h, respectively.

Nanotechnology-driven advantages

The nano-sized pores in the porous structure of the ceramic ultrafilter make it possible to absorb/separate tiny proteins from whey.

Applications

- Production of whey concentrate



NANOSTRUCTURE-COATED ANODE OF METAL OXIDES FOR SEAWATER ELECTROLYSIS

Atieh Pardazan Zohor Sharif

www.apzsharif.com

Description

This product is a metal anode whose surface is coated with a 20 nm-thick thin film of metal oxides, suitable for the electrolysis of seawater. As an appropriate alternative to metallic and graphene anodes, it benefits from a low wear rate and high geometrical stability.

Nanotechnology-driven advantages

Applying a nano-thick coating on the metal anode has resulted in:

- Reduced need for expensive catalytic elements
- Improved electric charge and stability

Applications

- Anode for the electrolysis of seawater





DURABLE NANOPARTICLE CONTAINING T R A S H B A G

Sabz Mohit Nano Aras

www.nanoproducr.ir

Description

This product is a durable nanoparticle-containing polyethylene-based trash bag for the collection of solid wastes with high resistance to tearing and leakage.

Nanotechnology-driven advantages

The nanoparticles of less than 100 nm in size have been added to the polyethylene-based trash bags with several purposes:

- Improving the tensile strength and elastic modulus
- Increasing the resistance to tearing and leachate leakage

The following table reports the measured values of mechanical features for the nano-sample and control sample.

Specimens	Yield point		Yield point		Modulus (MPa)
	Strength (MPa)	Elongation (%)	Strength (MPa)	Elongation (%)	
Nano sample	7.76	27.05	779,818	39.41	348
Control sample	7.86	23.75	567,785	17.78	302

Applications

Tearing-resistant trash bag for:

- Residential solid wastes
- Office, hospital and industrial media



RAT POISON POWDER

Rayan Zarin Sina

www.rayanzarinsina.ir

Description

This product is a powdery mouse poison enabling the killing or repelling of the mice in homes, gardens, and places inside which food and perishable materials are supplied. It is composed of a non-toxic material with spherical nanoparticles.

Nanotechnology-driven advantages

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

- High specific surface area (SSA) of nanoparticles
- High chemical reactivity of nanoparticles

Applications

- Homes
- Gardens
- Places in which food and perishable materials are supplied



ANTI BLOCK NANOPARTICLE CONTAINING POLYETHYLENE BASED MASTERBATCH

Baspar Pishrafteh Sharif

www.nanoproduct.com

Description

This product is a nanoparticle-containing anti-block polyethylene masterbatch, in which the added nanoparticles act as lubricant to facilitate the separation of polyethylene-based surfaces. It benefits favorable strength, formability, and low density, deserving to be used in the packaging.

Nanotechnology-driven advantages

The addition of nanoparticles to the polymeric matrix has led to:

- Emergence of anti-blocking property

Measured properties	Control sample	Nano sample
Required force to separate the polymer layers (N)	0.25	0
Longitudinal elongation (mm)	42	42
Longitudinal tensile strength (N)	13	13

Applications

- Nylon packaging
- Beverage container
- Kitchen appliances
- Fuel containers
- Tubes and joints



ANTIBACTERIAL GEOMEMBRANE

Decamond

www.decamond.ir

Description

A geomembrane is a kind of waterproof material with a basic polymer of high molecular weight and trivial permeability to moisture. It is often used as plastic sheets to cover the serious surfaces of gas/water reservoirs to prevent their leakage. This product is modified by antibacterial nanoparticles through which a strong antibacterial property is developed to protect water reservoirs from bacteria proliferation.

Nanotechnology-driven advantages

The incorporation of metallic nanoparticles into the polymer-based geomembranes has resulted in:

- The emergence of antibacterial property to suppress the bacterial proliferation
- Stronger antibacterial property with decreased nanoparticle size

Applications

- Lining of water supply canals, pipes and tanks
- Coating on garbage in landfills
- Protection of concrete structures exposed to corrosive chemicals
- Lining of concrete pipe walls in the sewerage network
- Control of inflatable soils



