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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 •**

C i v i l a n d B u i l d i n g

2021-2022

1







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 2003 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 2026. 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 equipments 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 2008 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:

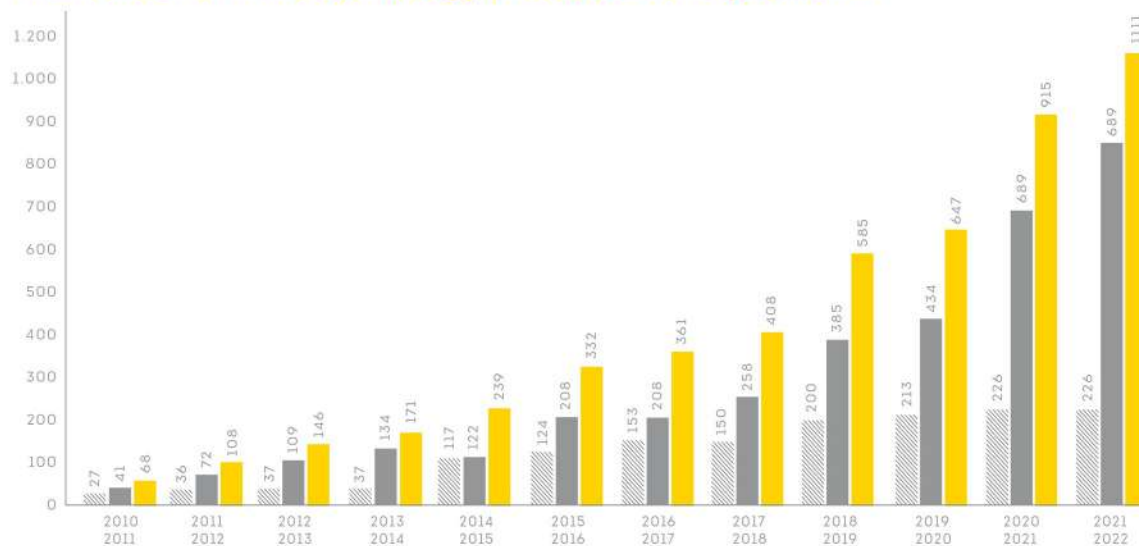
1. Nanotechnology or nanoscale scientific knowledge (1-100nm) is used in them.
2. The product applications and properties are improved by nanotechnology.
3. The product production process is based on engineering.

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

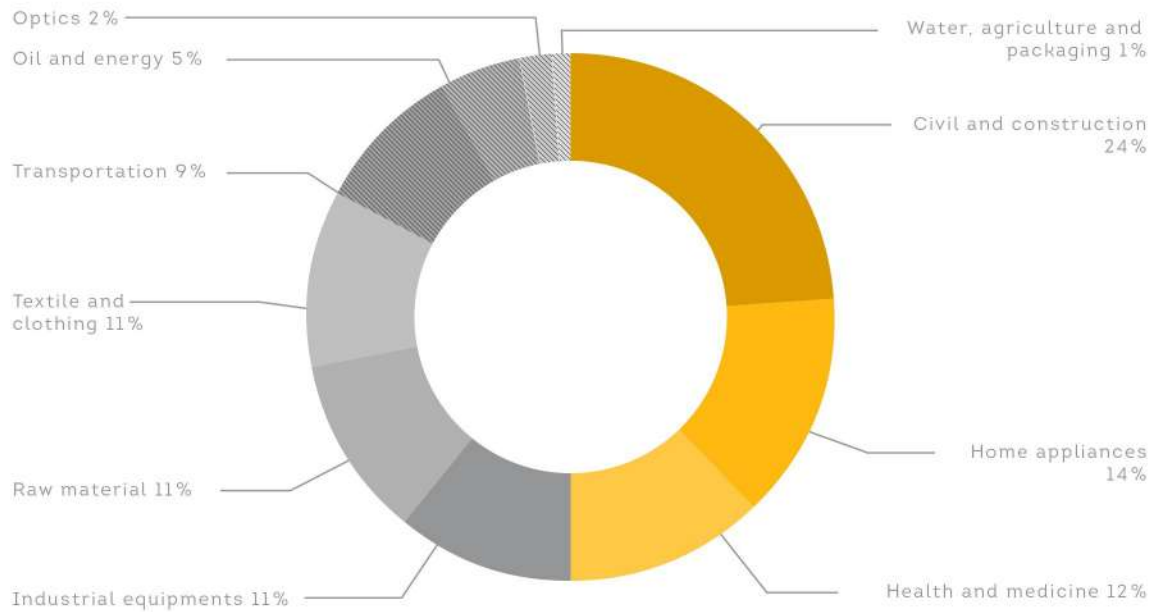


Manufacturing companies of nano products and equipments



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

Civil



Building



CIVIL AND BUILDING

UPVC Door and Window Profiles	1
Low-E Glass	3
Aluminum and Chromic Mirror	5
Reflective Double-Pane Glass Group	7
Structural LightWeight Concrete	9
Cement-Based Fireproof Coating	11
Epoxy Stone Adhesive	13
Antibacterial Stone Glue	15
Lightweight Concrete Pavement blocks	17
Wear-Resistant Epoxy Flooring	19
Sound-Absorbing polymeric Felt	21
Anti-stain Granite Tile	23
Antibacterial Ceramics & Tiles	25
Anti-bacterial Toilet & Wash-Stand Sink	27
Decorative Glass Tile	29
Nanostructured Coated Decorative Tiles	31
Decorative Coated Sanitary Faucet	33
Nanostructured Coated Decorative Door handle	35

Nanostructured Decorative Coatings	37
Golden Steel Sheets for Facades	39
PVC Foam Board	41
Antibacterial nanomaterial-modified polyvinyl chloride (PVC) sheet	43
Impact-Resistant UPVC Pipes	45
Silent Sewage Pipes & Fittings	47
Polymeric Manhole Cover	49
Concrete Manhole Cover	51
Antibacterial Acrylic Paint	53
UV-resistant and anti-bacterial Urethane acrylate resin containing nanometric components	55
Opaque & semi-gloss water-based acrylic varnish	57
Shield Paint for High-Frequency Radiations and Low-Frequency Electric Fields	59
Corrosion-Resistant Radiator	61
Hydrophobic Outdoor Light Bulb	63
Abrasion-Resistant nanoparticle-Containing Concrete Floors	65
Wear-Resistant Concrete Flooring	67
Decorative Gold Steel Sheet for Building Facade	69
Wear- and Corrosion-Resistant Aluminum Profiles with Nanostructured Anodized Coatings	71
Taps with Decorative Nanostructured Coating	73

UPVC DOOR AND WINDOW PROFILES

Shahin Sazeh Fajr

www.majol.ir

Description

This product is an unplasticized polyvinyl chloride (UPVC) profile for building windows being modified by certain nanoparticles. Such an improvement has dedicated a broad spectrum of significant features to the UPVC matrix such as satisfactory impact strength, high fracture toughness, and favorable stiffness.

Nanotechnology-driven advantages

Enhancement in impact resistance and compressive strength of UPVC parts through the incorporation of certain nanoparticles up to 3 and 12 times higher than that of standardized counterparts, respectively.

	Charpy impact strength (kJ/m ²)	Compressive strength (MPa)
Acceptable quality limit (AOL)	45	30
Control sample	69	263
Nano sample	143	375

Applications

- As a building material, especially double-glazed door, frame and window profiles
- As an insulator in cabling
- Dentistry
- Piping industry



LOW-E GLASS

Kaveh Glass Industry Group

www.kavehglass.com

Description

Low-E or low-emissivity glass is a kind of energy-efficient glasses designed to prevent heat loss through the windows and minimize the amount of infrared and ultraviolet light passing through. Low-E glasses are essentially standard clear ones with a transparent thin coating on their surface, promoting the heat reflection compared to their ordinary counterparts. This kind of glasses benefit a much lower heat transfer than ordinary ones and behave like a transparent thermal insulator,

without minimizing the amount of incident light. In essence, the significant characteristics including visible light transmittance (VLT) and reflectance (VLR) lie on the same plane for both this product and standard competitors.

Nanotechnology-driven advantages

By the exploitation of nanotechnology in low-E glass fabrication techniques:

- This product benefits higher heat insulation up to three times higher than the standard double glazing, enabling a reduction in energy consumption, environmental protection, and prevention of fog formation in winter.
- It enables blocking the direct solar heating at least two times better than the standard double glazing, providing thermal comfort and considerably reducing the running cost of air conditioners in summer.

Applications

- Utilization as a thermal insulator for residential & office buildings, hotels, hospitals etc.





ALUMINIUM AND CHROMIC MIRROR

Kaveh Glass Industry Group

www.kavehglass.com

Description

The conventional mirrors are typically produced through applying a reflective coating to the back of a transparent glass. The main reason behind this designation is the easy construction procedure, high transparency, considerable hardness, and polishing-assisted smoothed surface. Most glass mirrors are coated by silver in addition to a set of other materials. The present product is a reflective mirror with nanometric aluminium or chromium coating.

Nanotechnology-driven advantages

The distinguishing characteristic of the present product is the exploitation of nanometric aluminum or chromium coating. Among its benefits, lower cost compared to silver-coated mirrors (suitable for low-sensitivity applications) and satisfactory suitability for wet areas and humid places are of prime significance. Whenever the chromium coating is used, the mirror shows a high resistance to humidity and environmental moisture.

Applications

- Bathrooms
- Indoor swimming pools
- Dining halls
- Hotels
- Conference rooms
- Facade panels





REFLECTIVE DOUBLE-PANE GLASS

Kaveh Glass Industry Group

www.kavehglass.com

Description

The sun ray is composed of three main spectra including the ultraviolet radiation, visible light, and infrared radiation whose exposure may result in altering the visual color of the objects and dermal abnormalities, in addition to a rapid rise at temperature and cooling-related energy consumption. The ideal window for the residential buildings should be basically made of a well-designed glass, diminishing the intensity of transmitted infrared and ultraviolet radiations and maintaining the visible light characteristics. To achieve this purpose, the reflective double-pane glasses are developed.

Nanotechnology-driven advantages

To fully take the advantage of nanotechnology in manufacturing the reflective double-pane glasses, regular glasses are one-sided coated through the sputtering technique by specific metallic and metal oxide thin films of nanoscale thickness. This film enables the glass to transmit the visible light along a specific direction, but not in the opposite side. Meaningfully, if this product is utilized as facades of buildings, it is able to sufficiently reflect a vast majority of solar radiation, prevent UV rays from entering the house, and alleviate the transmitted infrared radiation. Additionally, the sputtering-processed glass benefits from high resistance to the abrasion, bending, heating up, and cutting.

Applications

- Facades of residential buildings and hotels
- Interior decoration
- Windows for chemical and biological laboratories
- Development of glass partitions and interrogation rooms



STRUCTURAL LIGHTWEIGHT CONCRETE

Behdis Saman Amin

www.vandidad-co.com

Description

For structural applications, it is strongly preferred to make use of the lightweight concretes bearing greatest possible mechanical strength and lowest possible in-place density. To develop such a product, the concrete blend or its pre-determined portion should be composed of lightweight coarse or fine aggregates. Among the common-place lightweight aggregates, the expanded shale, clay or slate materials are of prime significance. One can exploit a given nanoparticle for this means.

Nanotechnology-driven advantages

The included nanoparticles give the strength, impermeability and durability to the basic concrete. The compressive strength of the concrete has been evaluated and reported in the table below:

Sample	Compressive strength (kg/cm ²)
Acceptable Level of the standard	With the specific weight of 1600 kg/m ³ , minimum compressive strength :173 kg/cm ²
Control sample	127 kg/cm ²
Sample with Nano coating	192 kg/cm ²

Applications

- Ship building and offshore structures
- Construction and reconstruction of bridges
- Construction of earthquake-proof structures





CEMENT-BASED FIREPROOF COATING

FERMA High-tech engineering Co. Ltd

www.alvanpaint.com

Description

This product is a fireproof coating made of basic cementitious materials and inorganic lightweight fire-resistant nanoparticles for the protection of applied metallic parts in the structure of buildings. It provides a thermal insulation on the buildings or facilities and retards any increment in the skeleton temperature during the probable fire.

Nanotechnology-driven advantages

The inclusion of nanoparticles in the basic cement material has resulted in:

- Emergence of fireproof property in the final coating
- Strong interfacial adhesion between the coating and underlying substrate
- Extension of the time required for reaching a critical temperature at which the mechanical strength of structural steels is deteriorated.
- Superior thermal resistance

The aforementioned time has been reported below for both nano sample and control sample.

Specimens	Time to reach critical temperature (minutes)
Acceptable standard level	120
Control sample	100
Nano sample	150

Applications

- Fireproof coatings for building structures





EPOXY STONE ADHESIVE

FERMA High-tech engineering Co. Ltd

www.alvanpaint.com

Description

This product is an epoxy stone adhesive with a high degree of flexibility and transparency enabling filling the gaps due to its excellent adhesion. The shear strength of this product has been promoted through the dispersion of inorganic nanoparticles in the polymeric matrix in low concentrations.

Nanotechnology-driven advantages

The incorporation of certain inorganic nanoparticles into the basic epoxy has led to:

- Higher compressive strength
- Improved resistance to sagging
- Better elastic modulus, shear strength, and hardness

These improvements arise from a considerable increment in adhesive viscosity and physical stability. The measured results are summarized in the table below for the control sample and nano sample (coated one).

Sample	Compressive Strength (MPa)	Sagging amount
Control sample	0	Not stable
Nano Sample	132.8	1

Applications

- Adhesive for outdoor applications (facades)
- Alternative mortar for building mortars, stick stones, concretes, and bricks





ANTIBACTERIAL STONE GLUE

Idesazan Va Fanavaran Javan Sanat

www.javansanat.vcp.ir

Description

This product is an antibacterial stone adhesive for gluing the decorative stones used in buildings. It can effectively prevent the accumulation and growth of bacteria along with the strong adhesion properties, high resistance to temperature variations, cracking, and severe contraction and expansion.

Nanotechnology-driven advantages

The inclusion of nanoparticles in the polymeric matrix dedicates the following properties to this product:

- Hydrophobic characteristics
- Antibacterial properties
- High mechanical strength

The following table reports the antibacterial properties of the control sample and nano sample against the E.Coli and S. Aureus bacteria.

Specimens	Antibacterial Activity (According to ISIRI 10900)
Acceptable standard level	2
Control sample	0
Nano Sample (E.coli)	3.4
Nano Sample (S. Aureus)	3

Applications

As an adhesive for:

- Gluing woods, stones, carpets, glass and papers
- Bonding stone parts in homes, offices, and health care centers



LIGHTWEIGHT CONCRETE PAVEMENT BLOCKS

Aptus Iran

www.aptusiran.com

Description

This product is a multi-functional concrete comparatively lighter than its conventional counterparts with extraordinary paintability, low weight, water-proof feature, and high abrasion resistance. These intrinsic properties originate from the inclusion of oxide nanoparticles in the cementitious matrix.

Nanotechnology-driven advantages

Adding the oxide nanoparticles of pozzolanic nature has led to:

- Improved compressive, bending and tensile strength
- Better durability
- Decreased permeability
- Shortened setting time

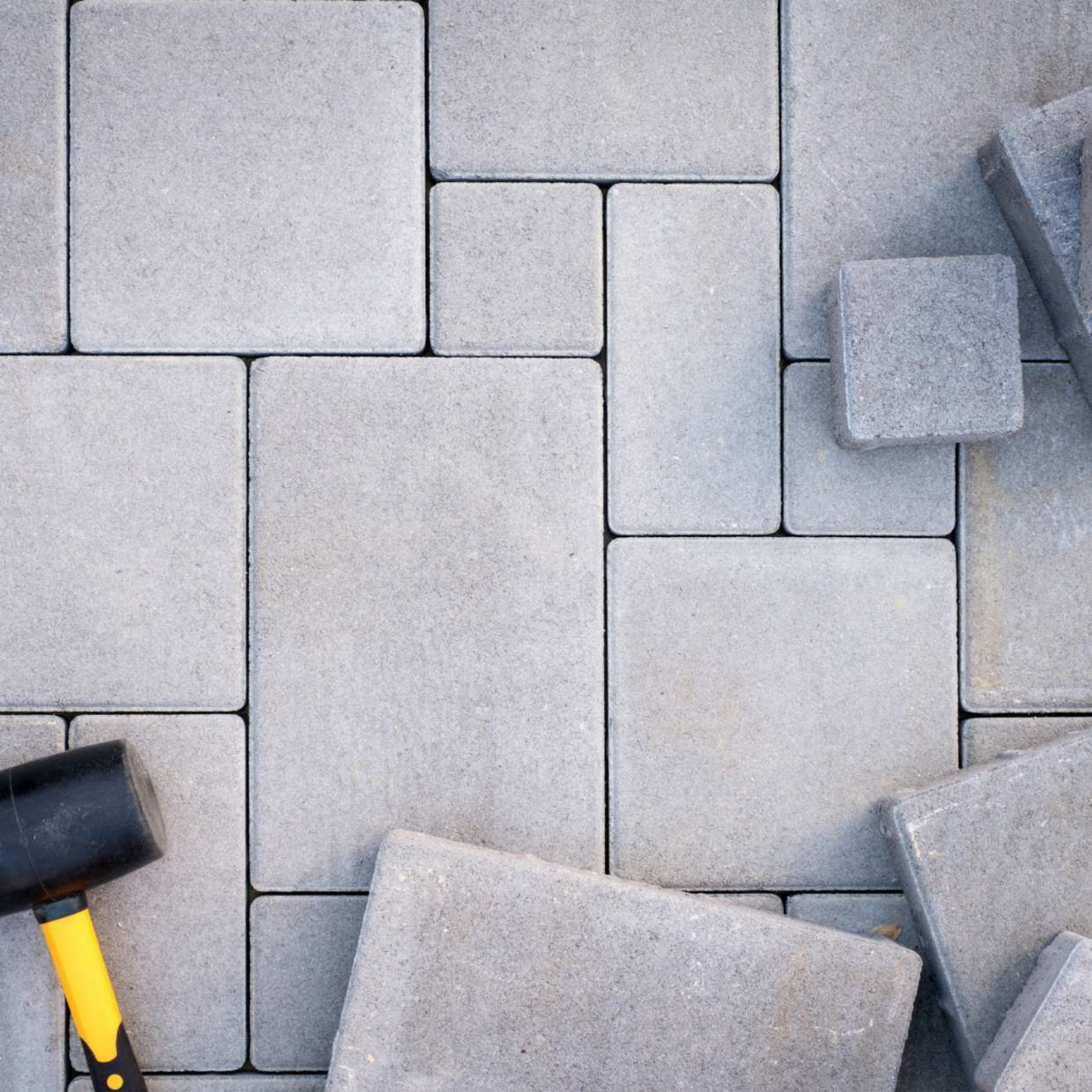
Some of these results have been reported in the table below:

Specimens	Compressive Strength (MPa)	Bending Strength (MPa)	Tensile Strength (MPa)
Acceptable standard level	≥ 50	≥ 5	≥ 3,6
Control sample	44,5	5,9	4,9
Nano sample	59,5	9,8	5,9

Applications

- Interior decoration or building exterior architecture
- Cement coating for restaurants, food courts, coffee shops, building facades
- Home interior decoration





WEAR-RESISTANT EPOXY FLOORING

Baspar sazan Iranian

www.basapolymer.com

Description

This product is a polymeric nanocomposite filled with appropriate oxide nanoparticles through which superior wear resistance and hardness can be obtained. These features can be beneficial to floorings for some serious applications such as clean rooms and hygienic places.

Nanotechnology-driven advantages

The presence of the hard fillers in the polymeric matrix has resulted in:

- Higher abrasion resistance
- Favorable hardness

The weight loss values during the standard wear test have been evaluated and reported for the control sample and nano sample in the following table:

Specimens	Weight Loss (gr) (According to ASTM D4060)
Control sample	137
Nano sample	54

Applications

Flooring for

- Clean rooms
- Hygienic places
- Food and beverage industries
- Residential and commercial places





SOUND - ABSORBING POLYMERIC FELT

Negin Rose Sepahan

www.neginrose.com

Description

This product is a sound-absorbing felt composed of silica aerogel and nonwoven polyester textile, and can be used on the floor and body of buildings to damp the noise and acoustic losses.

Nanotechnology-driven advantages

The sound-absorbing material in this product is a nanostructured ceramic whose presence dedicates some features to it:

- High absorption capacity of acoustic waves at intermediate frequencies
- Improved acoustic and noise damping capability

Applications

- As felt on the floor and body of residential and office buildings
- Recording studios, theater halls, meeting halls, cinemas and exhibitions
- Car, helicopter, plane, train, and ship





ANTI-STAIN GRANITE TILE

Kashi Geranit Behceram

www.behceramco.com

Description

This product is an anti-stain porcelain tile with an extremely densified structure and trivial porosity content.

Nanotechnology-driven advantages

The addition of the nanomaterial to this product has resulted in:

- Filling the superficial pores
- Avoiding the penetration of stains and pollutants into the surface
- Making the tile ideal for anti-stain applications
- Improving the mechanical strength, resistance to frost, ease of cleansing, and breakage threshold

Applications

This product can be used as a stain-proof tile in:

- Highly crowded places and industrial areas
- Hospitals and clinics where the hygiene takes the priority
- All buildings, floors, and walls



ANTIBACTERIAL CERAMICS & TILES

Tania Ceram Garizat

www.nanoproduct.ir

Description

This product is a ceramic-based tile benefiting from the antibacterial degradation of environmental pollutants. This feature originates from the incorporation of nanomaterials into the ceramic matrix or making nanocomposite blend. It can remove the pollutants in situ with no need for using the chemical cleansing or anti-septic substances.

Nanotechnology-driven advantages

The inclusion of nanoparticles in the ceramic matrix leads to:

- The advent of antibacterial activity
- The penetration of nanomaterials into the cell walls of bacteria
- The suppression of proliferation and reproduction in microorganisms

Applications

- Hospitals and clinics
- Bathrooms and public places
- Swimming pools and sport saloons





ANTI-BACTERIAL TOILET & WASH-STAND SINK

Marjan Garizat Sanitary Porcelain

www.marjansanitary.com

Description

This product is an antibacterial squat toilet and wash-stand sink being modified by the settlement of nanoparticles on ceramic surfaces in a solution medium. It enables removing the hazardous microorganisms such as bacteria, viruses, fungi, and other germs with no need for the detergents.

Nanotechnology-driven advantages

The well-engineered deposition of nanomaterials on conventional toilet and wash-stand sinks results in:

- The emergence of antibacterial activity
- The self-cleaning with no need for chemically corrosive detergents
- The prevention of growth and reproduction of microorganisms

The practical results for the evaluation of antibacterial properties against E Coli. And S. Aureus bacteria are reported below:

Specimens	Antibacterial activity (according to ISIRI 10900)
Acceptable standard limit	2
Control sample	0
Nano sample (E. Coli)	2.69
Nano sample (S. Aureus)	2.24

Applications

- Bathrooms
- Swimming pools
- Toilets
- Sanitary centers





DECORATIVE GLASS TILE

Tolu Avinmehr trading

www.bmc-mehr.com

Description

This product is a decorative glass tile whose optical vision is manipulated by using the nanotechnology, so that if it is exposed to the visible light, a broad spectrum of colors appears depending on the environmental conditions.

Nanotechnology-driven advantages

Applying nanometric glossy coatings is a new way of producing decorative tiles. The nanotechnology dedicates the following benefits to this product:

- Manipulating the visual/ optical characteristics
- Being observed in different colors in various lightening conditions

Applications

- The free spaces between the cabinets, interior walls, and partitions
- The walls around the shower and bathtub in the bathroom
- The decorative coverings of the columns and the part of the surfaces of the walls
- Floor coverings





NANOSTRUCTURED COATED DECORATIVE TILES

Negar Gostar Javid

Ara Ceram

www.negarestantile.com

www.araceram.com

Description

This product is a decorative tile which is painted in different eye-catching colors through the deposition of a nanostructured thin film by the physical vapor deposition (PVD) technology. The formed coatings are highly durable with long-term lifetime and noticeable gloss.

Nanotechnology-driven advantages

Applying a nanostructured thin film made of metal-containing compositions may result in:

- Generating a variety of colors such as gold, silver, and rose gold
- Prolonging the tile lifetime and durability
- Giving an eye-catching glow to the tile

Applications

- Covering the interior and exterior surfaces of decorations





DECORATIVE COATED SANITARY FAUCET

Karimpour

www.karimpourtaps.ir

Aroosha

www.shouder.com

Description

This product is a sanitary faucet with a nanostructured coating made of brass, bronze, copper, and steel. It benefits from a long-time durability and better appearance.

Nanotechnology-driven advantages

Applying a metallic alloy-based coating on the kitchen and toilet faucets can enhance:

- Beauty, quality, and lifetime
- Hardness
- Corrosion resistance
- Visual color

Applications

- Bathroom Taps
- Toilet Taps
- Kitchen Taps





NANOSTRUCTURED COATED DECORATIVE DOOR HANDLE

Moslehi

www.3aco.ir

Iran Bronz Steel

www.bronzesteel.ir

Tolerance

www.toleranceco.com

Iran Doorhandle

www.dastgirehiran.com

Description

This product is a door handle whose surface is coated by a nanostructured film through the physical vapor deposition (PVD) technique. Such a coating may prevent the blackness and wear of the handle arising from the long-time exposure to the hands and develop long-lasting durable colors.

Nanotechnology-driven advantages

Applying a nanostructured coating on the door handles can result in:

- Enhancing the hardness, wear resistance and corrosion
- Preventing the color change due to the long-time exposure
- Developing a strong adhesion to the substrate

Applications

- Handles for the house and kitchen's doors
- Door handles in interior decoration





NANOSTRUCTURED DECORATIVE COATINGS

Pars PVD

Tolerance

Atrisa

Iran Bronz Steel

Kimiyae Saadat Sanat Modern

Ara Ceram

Noor Mehr Hoda

Negar Gostar Javid

Harmony

Sam Sanat

Bakhshi

nanoproduct.ir

www.toleranceco.com

www.atrisataps.ir

www.bronzesteel.ir

www.nanoproduct.ir

www.araceram.com

www.golfapvd.com

www.negarestantile.com

www.nanoproduct.ir

www.nanoproduct.ir

www.nanoproduct.ir

Description

The product is a PVD-derived nanostructured coating, which can be deposited on Ti, Al, steel, brass, and Zamak, enabling high corrosion protection for indoor and decorative applications.

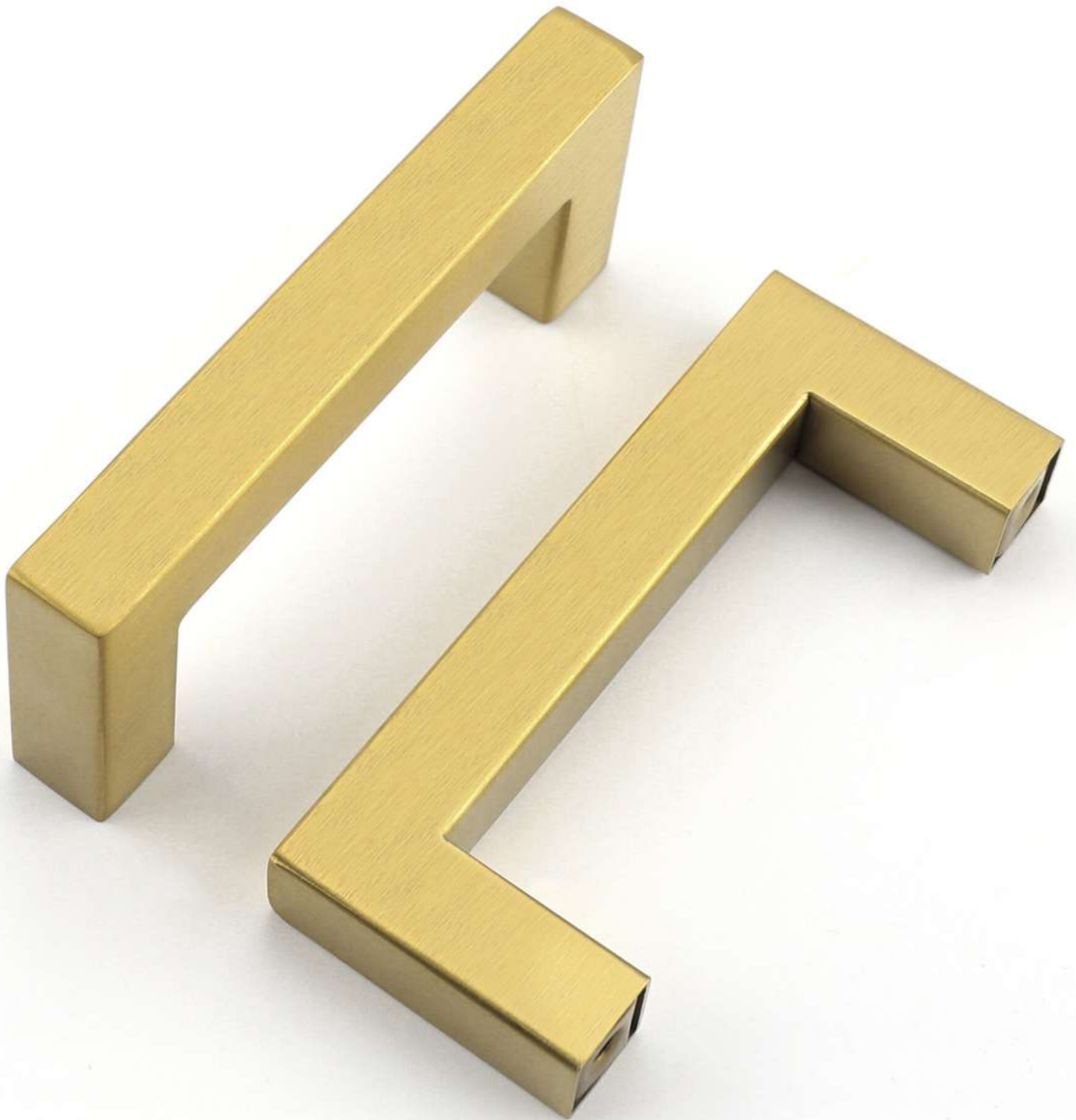
Nanotechnology-driven advantages

The deposition of a nanostructured ceramic coating on metallic substrates has led to:

- Desired appearance and color
- Excellent hardness and wear resistance
- Superior corrosion and erosion protection
- Adherent coating

Applications

- Surface finishing of the components used in buildings such as sanitary faucets, handles, valves, and plumbing
- Domestic appliances (knobs, oven, and cabinet fittings) Sporting goods, glasses frame, bags, and shoes accessories



GOLDEN STEEL SHEETS FOR FACADES

Mandegar Steel Pars

www.nanoproduct.ir

Description

The product is a ceramic-coated steel sheet with a desired appearance (i.e. golden color) deserving to be used in both interior architect and building facades due to its high mechano-corrosion performance.

Nanotechnology-driven advantages

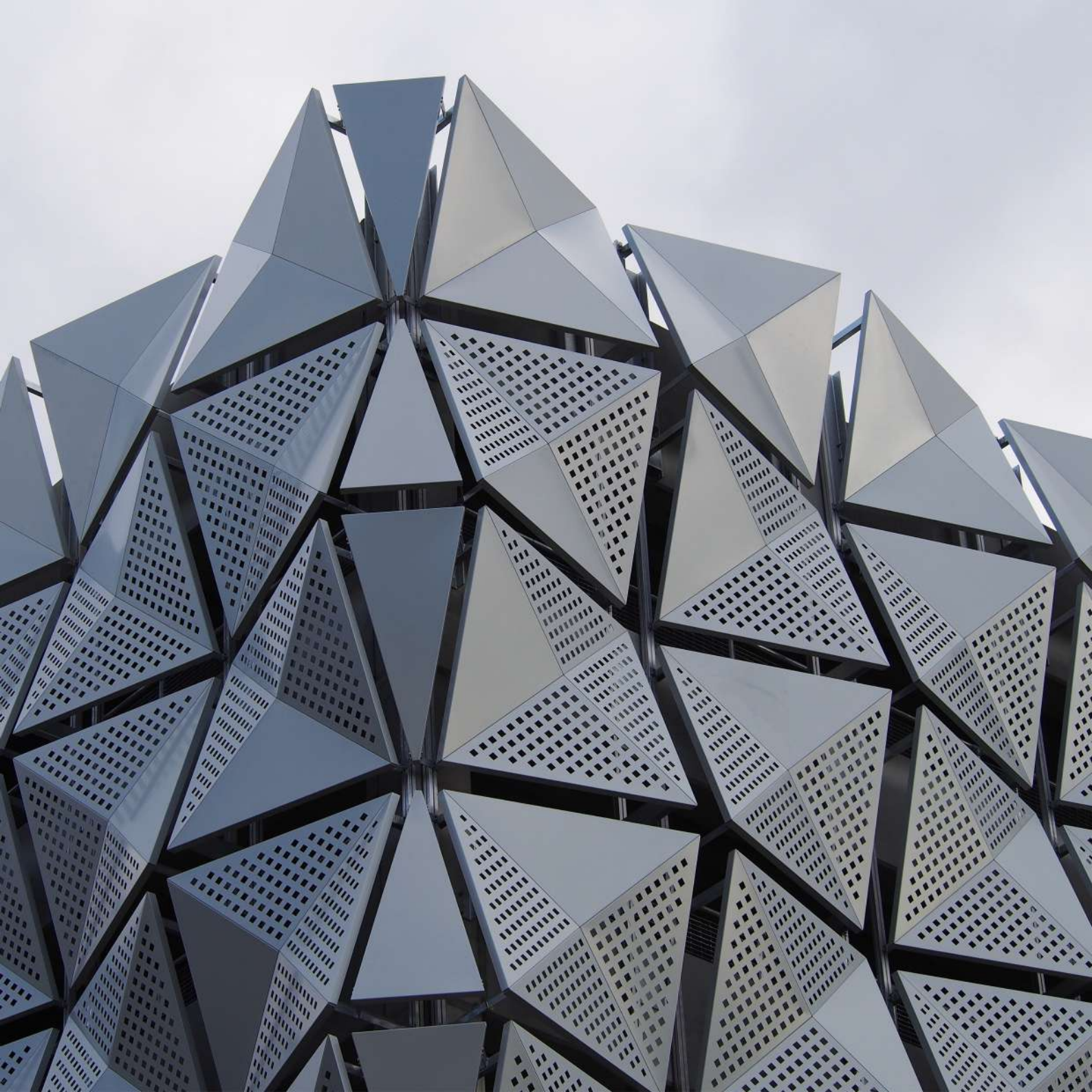
The deposition of a nanostructured ceramic thin film on steel has resulted in:

- High resistance to corrosion, abrasion, and wear
- Desirable appearance

Applications

- Interior architect including decorative appliances
- Elevator Cabins
- Building facades





PVC FOAM BOARD

Shafigh Industrial Group

www.nanoproduct.ir

Description

This product is a foam plate or foam sheet comprised of nanoparticle-reinforced PVC, which enables a better resistance to moisture and corrosion, and can serve as a noise and heat barriers. These plates are waterproof and can be engraved, embossed, painted, and laminated.

Nanotechnology-driven advantages

The incorporation of nano-sized additives can lead to the following multiple improvements:

- Higher hardness (deformation-resistant)
- Better fastening ability
- Enhanced color stability

Some of the aforementioned properties are evaluated and reported for nano-improved PVC foam and control sample as follows:

Measured properties	Control sample	Nano sample
Hardness [Shore B]	46.3	61
UV Yellowing [ΔE]	71.5	68.3
Screwing test Recorded force (kg)	61.7	76.3

Applications

- Public transportation including cars, buses, and trains
- Domestic decoration such as panels
- Toilet rooms
- Pools, saunas, and bathrooms
- Artifacts in outdoor environments, e.g. benches in parks
- Pre-fabricated houses
- Chemical laboratories
- Billboards, banners, display boards, and industrial / traffic signs





ANTIBACTERIAL NANOMATERIAL-MODIFIED POLYVINYL CHLORIDE (PVC) SHEET

Azaran Faza Nama

www.azaran.com

Description

This product is a PVC sheet coated by a nanoparticle-containing layer that provides high resistance against the moisture and corrosion. Among its main features, low cost, lightness, and satisfactory antibacterial activity are of prime significance.

Nanotechnology-driven advantages

The deposition of a nanoparticle-containing layer on PVC sheet yields several enhancements:

- Higher resistance to corrosion and moisture
- Improved antibacterial performance

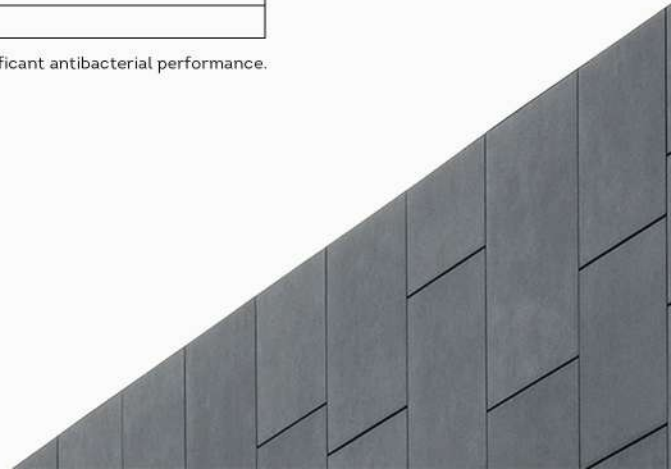
The practical results of the antibacterial assay performed on the nano sample and control sample are outlined in the following table:

Specimens	Antibacterial activity (ISIRI 10900)
Acceptable standard limit	2 (equivalent to 99% of bacteria)
Nano sample (S.Aureus)	2.07
Nano sample (E.coli)	2.59

* Note that the antibacterial activity value in the range of 2-3 corresponds to a significant antibacterial performance.

Applications

- Interior architecture
- Building facades





IMPACT-RESISTANT UPVC PIPES

Pishgam Plast Ahvaz

www.pishgamplast.com

Golsar Polymer Pad

www.gpg.co.ir

Description

This product is a UPVC pipe strengthened by the nanoparticles in which the embedded components act as filler.

Nanotechnology-driven advantages

The incorporation of nanoparticles into the UPVC polymer matrix has resulted in:

- Higher mechanical properties including the mechanical strength, elastic module, and fracture toughness
- Prolonged service lifetime (according to the INSO 9119-1 standard)

The results of quality tests such as the corrosion and impact tests are summarized in the following table:

Specimens	Corrosion	Impact resistance	Heat resistance	Vicat softening temperature
Acceptable standard value	Nope	10% _z TIR	5% _z (without any bubble or crack)	78
Control sample	Nope	37.5%	4.2% (without any bubble or crack)	84.3
Nanoparticles-reinforced UPVC	Nope	8%	5% (without any bubble or crack)	83.3

Applications

- Wastewater transfer systems



SILENT SEWAGE PIPES & FITTINGS

Hamid Group

www.vahidgroup.com

Description

This product is a soundproof pipe comprised of three layers, so that the middle layer is made of a nanocomposite material. There are both nanoparticles and microparticles present in this layer enabling desirable mechanical properties and optimized acoustic properties.

Nanotechnology-driven advantages

The incorporation of nanoparticles into the polymer matrix in the intermediate layer has yielded several improvements:

- Higher hardness and stiffness
- Enhanced acoustic properties

The mechanical properties of the product have been evaluated and their results have been summarized in the following table:

Mechanical properties (According to ASTM D638 and ASTM D6110)	Control sample	Nano sample
Yield Strength (MPa)	121.1	143
Elongation in Yield Point (%)	0	23.6
Elastic Modulus (MPa)	1163	2325
Charpy Impact Resistance (kJ/m ²)	43	64.6

Applications

- Insulation of fittings
- Pipes used in construction projects



Silent-Pro

POLYMERIC MANHOLE COVER

Tosee Honar Matin

www.matinfrp.com

Description

This product is a removable plate containing the lid over the opening of a manhole to prevent anyone or anything from falling in or to keep out unauthorized persons and materials. It is a nanoparticle-reinforced polymer composite which is low-cost with high mechanical properties.

Nanotechnology-driven advantages

The addition of amorphous nanoparticles as nanofiller to the polymer matrix has resulted in:

- Higher resistance to chemicals and corrosion
- Improved mechanical properties, e.g. the strength, module, and toughness
- Enhanced density

The practical results of permissible permanent set and pressure test are reported below:

Measured properties (According to INSO 14976)	Permissible permanent set (mm)	Pressure test (kN)
Nano sample	0.1	226.14

Applications

- Manhole cover



CONCRETE MANHOLE COVER

Rad Yavaran Soroush

www.nanoproduct.ir

Description

The manufactured product is a manhole cover made of nanoparticle-reinforced concrete which benefits from high corrosion and moisture resistance, lightness, and fulfills the economic aspects.

Nanotechnology-driven advantages

The addition of nanoparticles to the concrete can lead to the following achievements:

- Higher physicochemical properties, e.g. density, wear, and compressive strength
- Improved resistance to moisture and corrosion
- Prolonged service lifetime

The final characteristics of the nano sample have been listed below:

Studied properties	Allowed amount	Nano sample	Control sample
Load bearing capacity (kN) - EN124 standard	> 400	497	267
Permanent set (mm) - EN124 standard	< 2	0.1	Sample failure
Compressive strength (kN)	> 400	690	< 400
Weight loss during the freeze-thaw test (kg/m ²) - 14976 standard	< 2	0	1.5
Water to cement ratio	< 0.45	0.17	-
Maximum chlorine content (%)	< 0.2	0.03	-
Water absorption rate (%) - 14976 standard	< 6	2.7	-

Applications

- Waterways along roadsides and sidewalks



ANTIBACTERIAL ACRYLIC PAINT

Alvan Zhyk Paint and Chemical Industries

www.nanoproduct.ir

Description

This product is a nanoparticle-containing acrylic paint that possesses a satisfactory antibacterial activity.

Nanotechnology-driven advantages

The addition of metallic nanoparticles to the paint has resulted in:

- Increased antibacterial performance

The following table summarizes the results of the antibacterial assay:

Specimens	Antibacterial activity (INSO 13703 standard)
Acceptable level	>>99%
Control sample	0
Nano sample (E.coli)	99.4%
Nano sample (S.aureus)	99.78%

Applications

- Interior architect





UV-RESISTANT AND ANTI-BACTERIAL URETHANE ACRYLATERESIN CONTAINING NANOMETRIC COMPONENTS

Atlas Pooshesh Mohafez

www.nanoproduct.ir

Description

This product is a nanoparticle-reinforced urethane acrylic resin, enabling strong resistance to the UV radiation. It is inexpensive, lightweight, waterproof, and convenient to install.

Nanotechnology-driven advantages

The incorporation of nanoparticles into the polymer coating has resulted in:

- Higher resistance to the UV radiation
- Superior antibacterial activity
- Improved resistance to the shock and humidity

The experimental results of the contact angle test and color changing assay are given in the following table:

Specimens	Contact angle (degree) before exposure to UV radiation	Contact angle (degree) after exposure to UV radiation for 400 h	Color changing due to UV radiation [ΔE]
Control sample A	82	43	18.46
Control sample B	76	68	16.45
Nano sample	78	81*	9.6

Additionally, the results of the antibacterial activity of the nano sample are summarized below:

Specimens	Antibacterial activity
Standard acceptable limit	2 (equivalent to 99%)
Nano sample (S. aureus)	2.24
Nano sample (E. coli)	2.11

Applications

- Building facades
- Automobile body





OPAQUE & SEMI-GLOSS WATER-BASED ACRYLIC VARNISH

FERMA High-tech Engineering Co. Ltd

www.alvanpaint.com

Description

The first product is a water-based varnish that can be applied on the spread paint as a final layer to enhance its lifetime and durability. It is a nanoparticle-added water-based acrylic varnish with less toxicity. The second product is a water-based acrylic semi-gloss varnish, providing an acceptable resistance to both light and weather, rapid drying, and less toxicity.

Nanotechnology-driven advantages

The incorporation of nanoparticles into the polymer varnish has led to:

- Shorter drying time of varnish
- Better appearance
- Dedicating a higher strength to the underlying paint
- Improved abrasion resistance
- Enhanced resistance to UV radiation
- Prolonging the lifetime of the underlying paint
- Giving opaque and semi-gloss appearance to the applied paint

The practical results of the light reflection test for the control sample and nano sample are summarized below:

Specimens	Glossiness (in the 60-degree angle)	Glossiness (in the 60-degree angle)
Acceptable standard limit (ASTM D523 standard)	70GU > 10GU	Less than 10 GU
Control sample	126 GU	127 GU
Nano sample	43.9 GU	10.6 GU

Applications

- Traffic marking
- Building facades



SHIELD PAINT FOR HIGH-FREQUENCY RADIATIONS AND LOW-FREQUENCY ELECTRIC FIELDS

FERMA High-tech Engineering Co. Ltd

www.alvanpaint.com

Description

This product is a water-based paint modified by nanoparticles, benefitting from a strong electromagnetic shielding property. It possesses a low density (1.22 g cm^{-3}) and can be completely dried within a day.

Nanotechnology-driven advantages

The incorporation of nanoparticles has led to some achievements:

- A remarkable reduction in the intensity of electromagnetic fields within the range of 8-12 GHz.

The measured results of the electromagnetic shielding properties for the control sample and nano sample are provided below:

Applied test standard (ASTM D5568)	Wave transmission (%)	Wave reflection (%)	Wave absorption (%)
Control sample	69	16	15
Nano sample	0.01	90	10

Applications

- Walls of residential buildings
- Walls of places with sensitive electrical, electronic, and telecommunication devices





CORROSION-RESISTANT RADIATOR

Tash Industrial Manufacturing Group

www.tash.com

Description

This product is a radiator with a nano-thick coating made from metallic oxides. The coating has less toxicity compared to the conventional hard chromium.

Nanotechnology-driven advantages

The deposition of a nano-thick ceramic layer on the metallic radiator has resulted in:

- Enhanced corrosion resistance
- Enhanced interfacial adhesion to the underlying substrate
- Increased scratch resistance

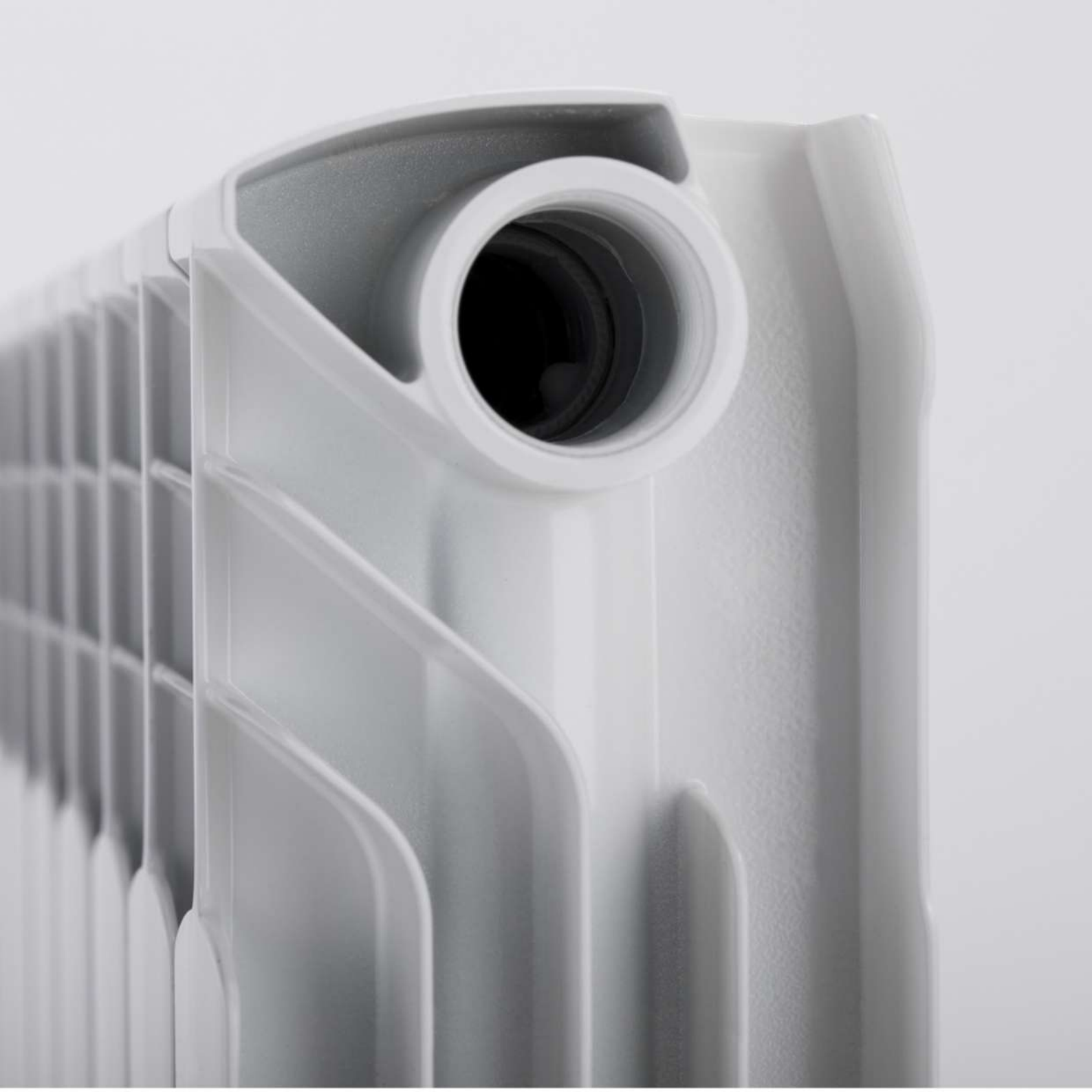
The practical results of the salt spray test are summarized below:

Sample type/ ASTM D1654 standard	Detachment	Corrosion
Control sample (with no coating)	Class 0	Class 0
Coated sample	Class 10	Class 9

*The class 10 is the best condition and class 0 is the worst one.

Applications

- Offices
- Residential and commercial buildings



H Y D R O P H O B I C O U T D O O R L I G H T B U L B

Golnoor

www.golnoor.com

Description

This product is a light bulb whose external surface is chemically modified to show a hydrophobic property. This feature has made the bulb self-cleaning and no pollutant can be settled down on it.

Nanotechnology-driven advantages

The creation of micrometric and nanoscale roughness on the external surface of the light bulb through the functionalization has led to:

- Emergence of hydrophobic property on the external surface of the light bulb
- Considerable changes in chemical and physical interactions between the superficial regions and settling pollutants

Applications

- Outdoor places
- Places with a high level of air pollution



T R A V E R S

ABRASION-RESISTANT NANOPARTICLE CONTAINING CONCRETE FLOORS

Behdis Saman Amin

www.vandidad-co.com

Description

This product is a well-engineered flooring composed of inorganic nanoparticles and cementitious materials with excellent resistance to abrasion and bending. It can successfully tolerate the climate change, as well as cold, heat, and moisture.

Nanotechnology-driven advantages

Adding the inorganic nanoparticles to the cementitious matrix has resulted in:

Performed tests (According to INSO 755-2)	Results for nano sample
Bending strength (MPa)	≥6
Absolute water absorption (%)	5.97 (for control sample: 5.844)
Surface wear (mm)	13.5 (for control sample: 15.8)

Applications

- Industrial and decorative floorings
- Parks
- Sidewalks and intersections
- Stairs and ramps surface
- Refinery yards and refueling stations



WEAR - RESISTANT CONCRETE FLOORING

Aptus Iran
Behdis Saman Amin

www.aptusiran.com
www.vandidad-co.com

Description

This product is a well-engineered concrete whose operational properties are improved by adding oxide nanoparticles. It is used for building constructions and industrial applications.

Nanotechnology-driven advantages

Adding the inorganic nanoparticles to the cementitious matrix has resulted in:

- Enhanced compressive, bending and tensile strengths
- Strongly improved durability
- Reduced permeability

Applications

- Building blocks
- Constructions and apartments
- Industrial facilities



DECORATIVE GOLD STEEL SHEET FOR BUILDING FACADE

Mandegar Steel Pars

www.mstpars.com

Description

This product is a golden steel sheet whose surface is coated by a yellow ceramic thin film. It ensures the decorative beauty and makes the main instrument anti-corrosive and anti-abrasive.

Nanotechnology-driven advantages

Applying a ceramic thin film on the steel sheet can lead to:

- Better corrosion resistance
- Improved abrasion and erosion resistance
- Strengthened mechanical properties

Applications

- Interior and exterior facades of buildings, elevators and other decorative applications



WEAR AND CORROSION RESISTANT ALUMINUM PROFILES WITH NANOSTRUCTUREDANODIZED COATINGS

Pasargad Alborz Aluminum Company

www.nanoproduct.ir

Description

This product is an aluminium profile whose surfaces are anodized for varying their physicochemical characteristics. It bears desired wear and corrosion resistances.

Nanotechnology-driven advantages

The generation of a nanoporous structure at the surface of aluminium profile has given rise to:

- Improving the adhesion of paint on the profile surface
- Enhancing the wear and corrosion resistances
- Increasing the paintability
- Reducing the friction coefficient of the profile surface
- Boosting the aesthetic appearance

The wear resistance of the nano sample has been evaluated and its results are reported below:

Specimens (According to ASTM D5568)	Wave absorption	Wave reflection	Wave transmission
Control sample	12	15	70
Nano sample	10	90	0.01

Applications

- Building structure such as retaining walls and columns
- Bridges
- Building doors and windows
- Fences of staircases
- Automotive and aircraft industries



TAPS WITH DECORATIVE NANOSTRUCTURED COATING

Kelar Pooya

www.kelarpooya.com

Karimpour

www.karimpourtaps.ir

Derakhshan Sanat Anahita

www.derakhshantaps.com

Pashazadeh Avisa

www.nanoproduct.ir

Aroosha

www.shouder.com

Atrisa

www.atrisataps.ir

Description

This product is a tap whose surface is finished by a nanostructured ceramic layer, bearing golden and rose gold colors. The ceramic top coating is tightly bound to the underlying substrate, meeting both appropriate appearance and service performance requirements.

Nanotechnology-driven advantages

The deposition of the nanostructured coating over metallic substrates may lead to:

- Enhanced mechanical, corrosion, and wear properties
- Providing better appearance

Applications

- Bathroom taps
- Toilet taps
- Kitchen Taps

