Project:
Self cleaning and antifogging coating of photocatalytic technology for glass surfaces

Industry:
Photovoltaics (PV)
Solar heaters
External glass boards

Product:
Water-Based nanotechnology titania suspension applied by spraying

Key benefits:
- Self-cleaning by absorbing sunlight
- Antistatic - Prevents dust accumulation
- Antifogging - superhyrdophilic
- Increases glass transparency
- Prevents slime and dirt accumulation
- Binds chemically and permanently exhibiting advanced lifetime

Applications:
- Efficiency improvement of photovoltaics (PV)
- Efficiency improvement of solar heaters
- Reduces the frequency of cleaning and maintenance

Packaging:
Canisters of 10L and 30L

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SurfaShield® G

Active Self-Cleaning Nanotechnology for the Maintenance of Highly Transparent Glass Surfaces

SurfaShield G is an invisible coating based on nanostructured titanium dioxide, which after application on the glass surface exhibits a remarkable property: it abrorbs surrounding light (ultraviolet) and transforms it to chemical decomposing any pollutant touches the glass surface. Thus, glass surfaces become self-cleaning without affecting substrate's transparency. Oppositely, the transparency is increased as nanoparticles reduce the local roughness of glass that would reflect light. Additionally, SurfaShield G acts as antistatic preventing sand and dust accumulation. The action of the coating is enhanced by antifogging properties: Water cannot form droplets that scatter light and the fogging effect is prevented in high humidity/low temperature conditions.

Glass window treated externally with SurfaShield G

Glass window without treatment

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Pioneering Nanotechnology

Which are the benefits for photovoltaics (PV) systems?

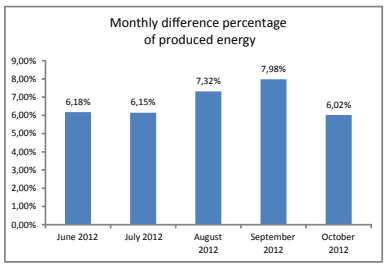
The application of SurfaShield G on photovoltaics increases the efficiency about 2% just after application. This is due to the transparency increase of protective PV panel glass: the coating reduces the surface roughness allowing more energy to reach the solar cell. Additionally, an increase of 3-7% is achieved as the glass surface remains cleaner, without particles, dust or stains that affect negatively the PV efficiency.

SurfaShield G ensures that the total increase of PV efficiency ranges between 5-9%.

How SurfaShield G ia applied?

SurfaShield G application is realized by Tornador of Bendel GmbH. The application requires a portable air compressor. The appplication should be realized by specialized technicians to avoid optical coating defects. It has been measured that the time needed for the application is 2 minutes for every surface square meter. The total consumption rate of the product is 30 m^2/L.

Portable PV panel adter 6 months of exposure to natural environment. The difference of right module (untreated) with the other two (SurfaShield G treated) is obvious.



Comparison of total produced energy between an untreated PV module and SurfaShield G treated during 2012.

How the effect of SurfaShield G on PVs was studied?

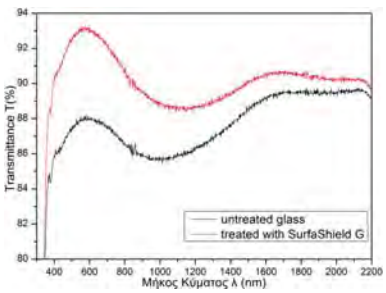
The study of SurfaShield G coating effect was realized by National Technical University of Athens (NTUA) at Technology Park of Lavrio with 24 hour recording of PV parameters and environmental conditions. It was proved that during the period of June to October of 2012 the total produced energy was enhanced by 7% compared to a PV system without SurfaShield G coating.

Economotechnical study for SurfaShield G

According to the product's consumption rate, materials and application costs and the increase of produced energy it is calculated that the depreciation time is less than 6 months! The extra produced energy after this time period will be translated to profit. The energy benefit can balance potential interests of financing or similar losses.

The coating lifetime can outreach 10 years. The coating is permanent and there is no need for periodic maintenance. The action of the coating is continuous under sunlight irradiation: the photocatalytic activity of nanostructured titania ensures that active ingredients are not consumed during function.

SurfaShield G application with Tornador applicator of Bendel.



Glass transparency spectrum before (black) and after (red) SurfaShield G application.

Physical Properties

Milky white water suspension with slight odour.
pH = 9-9.5. Flash Point: 41°C (closed cup method). Density: 0.98 g·cm^{-3} Viscosity: 1.5 cP. SurfaShield G is not considered an oxidant.

Safety & Storage

SurfaShield G contains no dangerous ingredients and it is water based. Volatile Organic Content (VOC): 136 g/L. Flammable. Always request, read and comprehend the Safety Data Sheet. Product lifetime in closed container: 18 months. Shake before use.

What is Nanotechnology?

Nanotechnology refers to the scientific field, which deals with very small structures, usually sized below 100 nm. One nanometer (nm) is one billionth of a meter (10^{-9} m) - it is so small that if earth were one meter in diameter, then one nanometer would have been the size of an apple! Nanosized materials reveal unique properties when compared to ordinary, bulk materials or even molecules.

NanoPhos at a Glance...

At NanoPhos, we take advantage of the unique properties of nanotechnology and invent clever materials that solve every day problems. By harnessing nanotechnology, we seek to create a more comfortable, safe and trouble-free living environment. We transfer innovations out of our lab into the hands of consumers. Our vision is clear: "Tune the nanoworld to serve the macroworld" – in simple terms we make nanoparticles solve common problems. NanoPhos was recognized in January of 2008 by Bill Gates as one of the most innovative companies and also received the 1st prize for innovation at the prestigious 100% Detail Show in London. NanoPhos is a rapidly growing company that is actively expanding its distribution network. Currently, the company is present in the UK, Ireland, Norway, Sweden, Finland, Denmark, Portugal, Italy, Greece, Cyprus, Japan, K. of Saudi Arabia, K. of Bahrain, China, New Zealand, Australia and Mexico.

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NanoPhos SA has been approved by Lloyd's Register Quality Assurance to follow the EN ISO 9001:2008 Quality Management System and EN ISO 14001:2004 Environmental Management System for the production and sales of chemical products for cleaning and protection of surfaces and nanotechnology products.

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