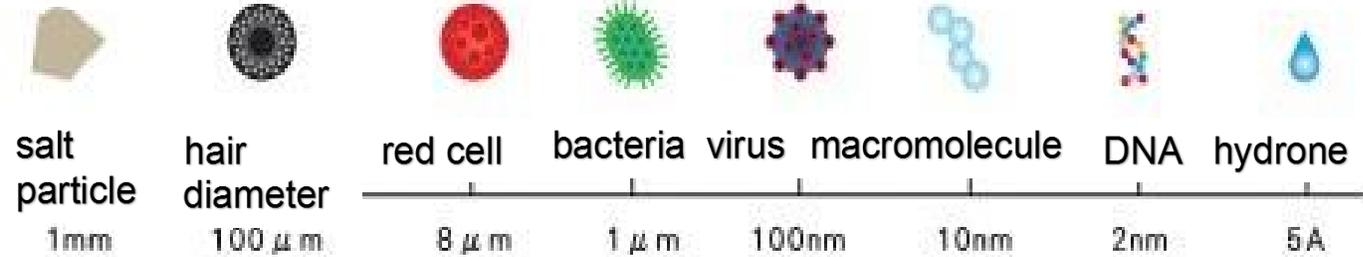


# New nanometer material introduction



# What's nanometer ?



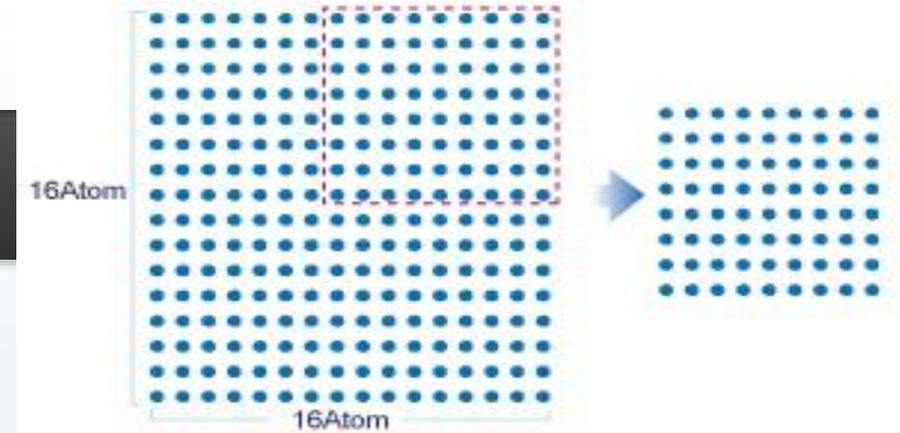
A:angstrom ( 0.1um ) nm: nanometer μm: micrometer

➔ One nanometer is one billionth of a meter. How small is this size?

➔ The scientific community regard the field larger than 100 nanometers as the macroscopic world, and the field from 1 nanometer to 100 nanometer Called the mesoscopic world, less than 1 nanometer is called the microscopic world.

➔ The diameter of the virus is approximately 60 to 250 nanometers, and the diameter of the red blood cells is approximately equal to 2000 nanometer, the diameter of the hair wire is 3000-5000 nanometers

# Main Features



- **Surface-to-body ratio effect:** Under the same volume, the smaller the particles, the larger the surface area. At this time, the surface-to-body ratio effect cannot be ignored.
- **Quantum effect:** When the particles fall below the nanometer size, quantum effects must be considered. At this time, the energy level changes from continuous to phase, and the electrical, magnetic, and optical characteristics have undergone significant changes. For example, the conductive metal becomes an insulator after nanometerization.
- **Quantum tunneling effect (macroscopic quantum tunneling effect):** In classical mechanics, particles cannot overcome potential energy barriers and have the effect of passing through walls. However, in the atomic micro-environment, electrons have a higher potential energy barrier than themselves, but have a tunneling effect, so it is called quantum tunneling.

Great changes after nanometerization, the following physical properties will change after "nanometerization". Sound properties, optical properties, electrical properties, magnetic properties, thermal properties, chemical properties, mechanical properties.

# New nano composite material

	Item	Conditional unit	Specification
<b>Physical property</b>	Appearance	Standard	Light yellow aqueous solution
	Main ingredient	-	Titanium dioxide, water and silver
	Solid content	Weight percentage wt %	1.0 - 1.2
	Particle size	nm	<100nm
	PH	-	7.5 - 9.5
	Viscosity	25°CmPa·s	<5
	Refractive index	-	2.2 - 2.4
	proportion	25°C	1.02
	Freezing point	°C	4
<b>Safety</b>	Oral toxicity test	LD50(mg/kg.mouse)	>5000mg/kg
	Skin irritation test	Primary irritation index	0

## Material characteristics and application description:

The new nano-composite material is a new type of nano-composite surface treatment and environmentally friendly non-toxic material designed to provide general indoor environmental needs. It has self-cleaning, ultra-high temperature resistance (below 500°C), high hardness, antibacterial, anti-viral, air purification, and removal of the environment. Pollution, highly functional surface treatment environmentally friendly material solution.

### **Material functionality:**

Excellent anti-fouling, self-cleaning & deodorization & anti-bacterial & anti-viral & removal of pollution (formaldehyde) in the environment, TVOC & nano-materials with excellent adhesion, non-toxic and environmentally friendly materials and other characteristics.

# Titanium dioxide (TiO<sub>2</sub>)

Titanium dioxide, chemical formula is TiO<sub>2</sub>, commonly known as titanium dioxide, mostly used in photocatalysts, cosmetics, can rely on ultraviolet light

Even visible light disinfection and sterilization, there are already some products available. Titanium dioxide is a catalyst for the reaction of water to produce hydrogen and oxygen. Titanium dioxide can be made into a photocatalyst for purification

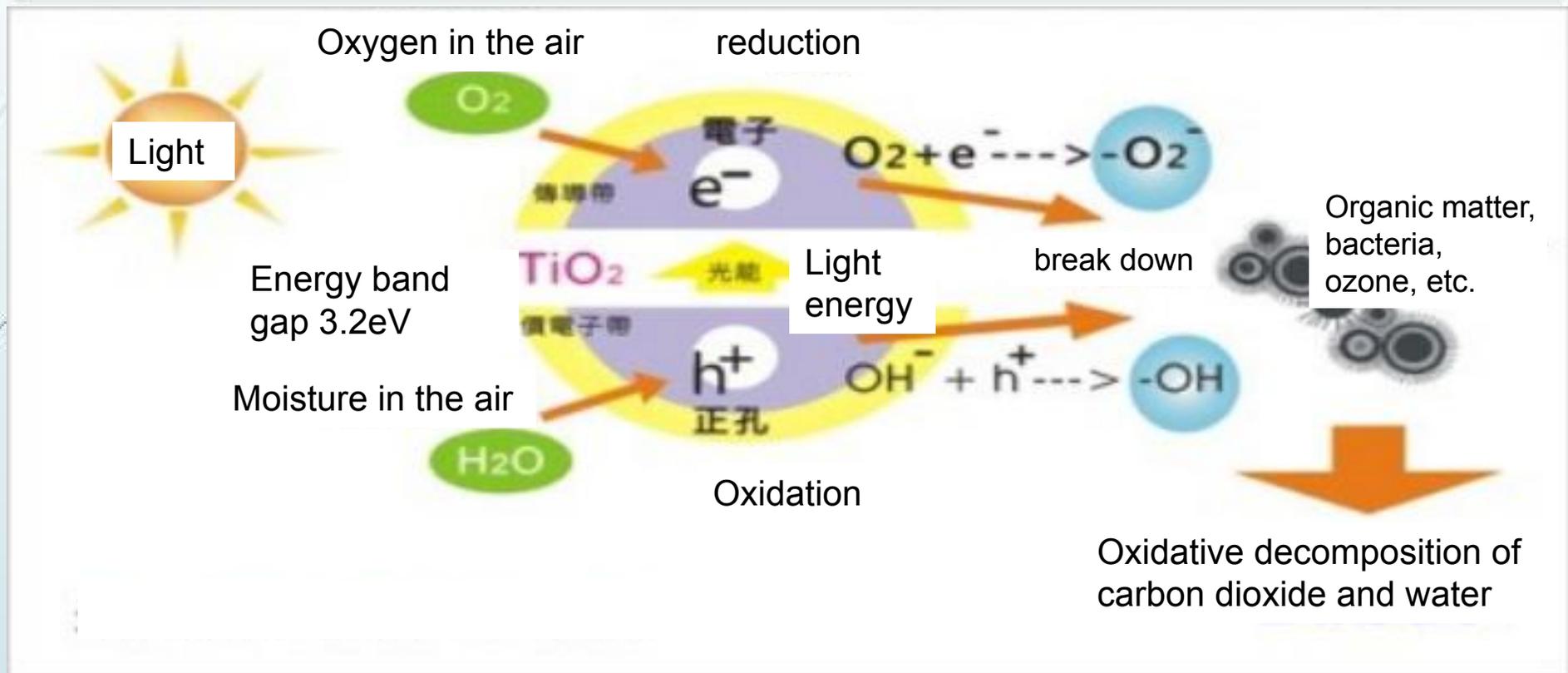
Air can eliminate 25% to 45% of nitrogen oxides in vehicle emissions, and can be used to control PM<sub>2.5</sub> suspended particulates, excessive air pollution.

**Titanium dioxide crystal type:** anatase type (Anatase)/rutile phase/brookite type

There are four main advantages of titanium dioxide:

- 1) Titanium dioxide is resistant to strong acids, alkalis and organic solvents.
- 2) Titanium dioxide will not dissolve itself in the photochemical reaction.
- 3) Titanium dioxide does not contain toxic substances.
- 4) The raw material of titanium dioxide is rich in titanium ore, and the price is low.

# Photocatalyst principle diagram



- The energy generated by light (below normal normal light) triggers the oxygen and water molecules nearby converted into highly active  $\text{O}^-$ ,  $\text{O}_2^-$ ,  $\text{O}_3^-$  (superoxide ions) and hydroxyl radicals ( $\text{OH}^-$ ) to decompose organic substances (viruses, bacteria, odor, oil dirt, dust, harmful to humans or the environment), convert it into carbon dioxide ( $\text{CO}_2$ ) and water ( $\text{H}_2\text{O}$ ), this is the role of **photocatalyst**.

# Silver

Silver is a soft and white shiny transition metal with the highest electrical conductivity, thermal conductivity and reflectivity among all metals.

Silver has high ductility, so it can be rolled into a transparent foil that is only 0.00003 cm thick, and 1 gram of silver particles can be drawn into filaments about two kilometers long.

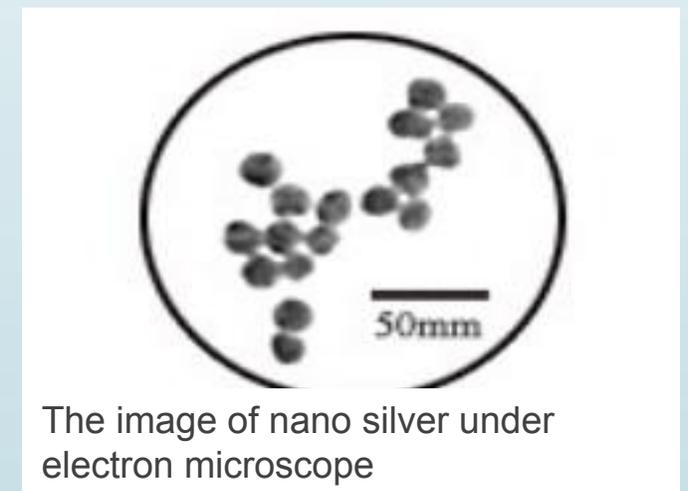
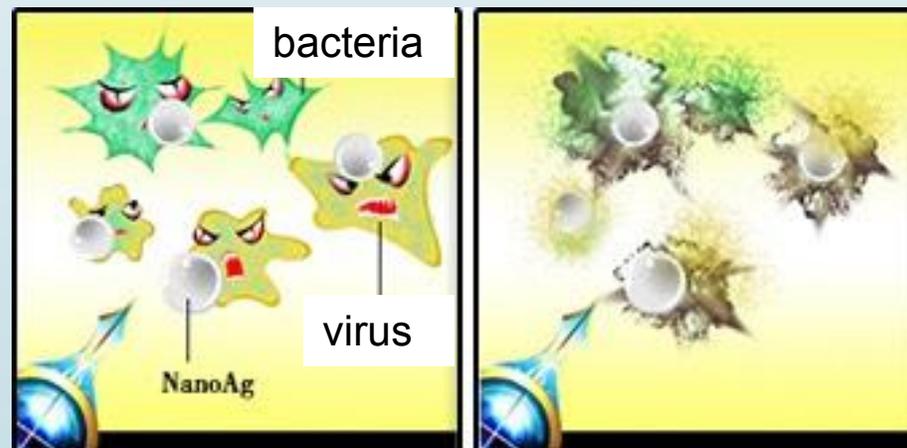


**Electrolytic silver**

# Nano Silver

The principle of action is that nano silver easily adsorbs oxygen atoms on the surface of nano silver particles, so it has strong oxidizing power for microorganisms, and can interact with the hydrogen-sulfur functional group (-SH functional group) on the surface protein of microorganisms, that is, its structure is destroyed by oxidation to achieve excellent antibacterial effect.

**Nano silver** has many advantages such as broad-spectrum bactericidal effect, no drug resistance, no toxicity, no irritation irritation, no need for light activation and no influence by acid and alkali values. Nano silver also has the property of emitting far infrared rays. It has good emissivity in the wavelength range of 4 to 400 microns. It can improve fine circulation, improve immune system function, increase skin activity, improve joint pain, and increase body oxygen content to promote metabolism.



The image of nano silver under electron microscope

## Advantages of nano silver combined with titanium dioxide

- Nano-silver has a powerful ability to kill bacteria, but it cannot decompose the corpse of bacteria. When the nano silver is covered, it loses the function of sterilizing and killing viruses, which is the biggest flaw.
- **Photocatalyst** has a good decomposition effect, but it has limited energy activity of light, it should not be too long without light reaction, just like a rechargeable battery, this is the biggest flaw.
- So after combining the two, the nano-silver strikes all the time to kill bacteria and viruses, and the active titanium dioxide photocatalyst is used to decompose corpses and organic dirt, etc.
- A good cycle is achieved, which improves the defects of old materials. And according to the characteristics of the two materials, such as anti-fouling, anti-corrosion, anti-bacterial, anti-viral, anti-odor and anti-harmful substances, it can be widely used in various medical, human health, supplies, food, clothing, housing, travel, education, entertainment etc.