



Differences between Vacuum Coating BlueMirror and SOL-GEL NANO Blue Mirror

Background on SOL-GEL NANO Mirrors

SOL-GEL NANO Coating Blue Mirror

Blue mirror special features

The advantages of HSR SO-GEL NANO mirrors



The differences between Vacuum Coating Blue Mirror and SOL-GEL NANO Blue Mirror:

Vacuum Coating

Advantages:

- Mass production
- Low cost
- Less advanced technology

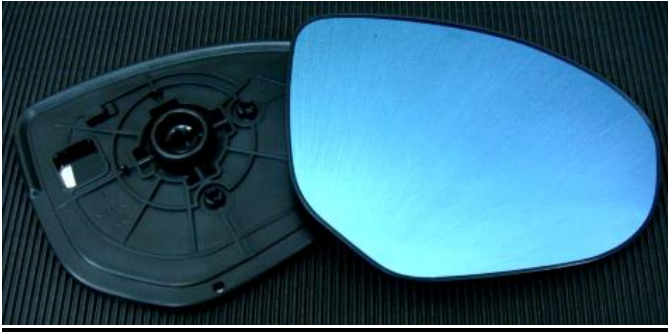
Disadvantages:

- Easy to disintegrate
- Weak corrosion resistance
- Uneven color
- Weak coating hardness
- Limited to small sized material

Here describes problems of blue mirrors produced by a method called *vacuum coating*. Most of conventional blue rearview mirrors available in the market are produced via the method of *vacuum coating*. For this method, a first layer of chrome is coated on a mirror prior to a thin second layer of blue coating is coated on the first layer of chrome. Often time mirrors have dirt or dusts on thereof. As this method applies on these mirrors having dirt or dusts, adversely the dirt or dust is also coated on certain surface areas of these mirrors. As a result, the blue coating cannot be firmly coated on the surface areas of the mirrors where consisting of dirt or dusts. Consequently, after normal wears and tears, such as wiping and washing the mirrors, the blue coating disintegrates from the mirrors. This negative effect is called “pinholes” in the industry.

Furthermore, it is well known that corrosion resistance of blue mirrors, produced via the method of *vacuum coating*, is weak. As these mirrors under a long period of rain, sunshine, and treatment of chemical cleaning agent, the color of blue coating is easily faded, especially the LED portion of the mirrors. In addition, the LED portion is easily scratched because the LED portion has a thinner coating layer that allows light transmittance. Because of the thinner coating layer, the surface hardness of the LED portion becomes weaker, resulting in being easily scratched.

Background on SOL-GEL NANO Mirrors



The SO-GEL NANO technology is currently being internationally recognized as the most promising and valuable in new materials development and product development. This technology allows small particles (each is smaller than 100 nm) chemically bonded. The chemically bonded particles have the ability to suspend in the liquid to provide the characteristic of being transparent to the eyes, called SO-GEL NANO. The SO-GEL NANO technology is very mature. As a result, the application of this technology is widely used in various industries, such as optoelectronics, electronics, and chemical industries. Here are some specific products using this technology in the foregoing industries, such as transparent conductors, electrochromic glasses, light laser, etc.

The reason the SO-GEL NANO technology is widely used in the industries now is because it is able to provide a solution to a common issue of the conventional vacuum technology that cannot meet the industry demand, specifically for large, non-flat, surfaces and processed plastic materials. The SO-GEL NANO technology is able to satisfy the current market demand because it has the following qualities: It can create materials that having a variety of refractive index (e.g. 1.35 to 2.) The materials not only can absorb the ultraviolet, infrared reflection, the materials can also produce glasses coated for anti-reflection, anti-reflective, anti-UV, etc. To summarize the advantages of SO-GEL NANO technology over the conventional vacuum coating technology, the SO-GEL NANO technology can produce supreme products that the conventional vacuum coating technology is incapable of.

(SOL-GEL NANO COATING / BLUE MIRROR)

SO-GEL NANO coating / blue mirror

Advantages:

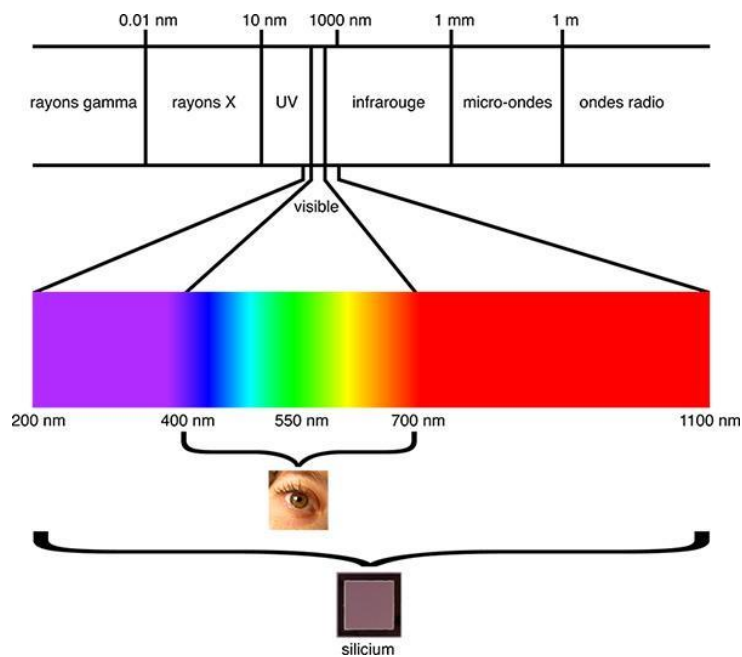
1. Impossible for the coating to come off
2. Strong anti-corrosion
3. Uniform color
4. Strong coating hardness
5. Able to produce large-size glasses
6. High reliability of the products

Disadvantages:

1. High manufacturing costs
2. Advanced technologies required to manufacture
3. The formulas used to manufacture is trade secret
4. Stringent manufacturing environment

SO-GEL NANO is not used in the conventional metal coating process, rather used in the manufacturing process in producing blue mirrors, having the surface hardness as 7 H (, the average is 9H). The manufacturing environment for blue mirrors is very stringent. The equipment and the environment require an extremely high standard of cleanness to make sure there are no dirt and dusts. The humidity and temperature control, which is required to be precise and stable, is important. As a result, in order to manufacture blue mirrors that are high quality, it requires the state of the art equipment and the state of the art clean room.

Because SO-GEL NANO blue mirrors produce blue color that is perfectly uniform, people might mistakenly think that this perfectly uniform blue color is the result of coating the blue color directly onto the surface of the mirror. In contrast, the blue color is not the color of the coated mirror. Rather, the coated mirror does not have any colors at all. As a matter of fact, the blue color that you see is the reflection of spectrum that is seen by human eyes. As the back of the coated mirror processed with a layer of black color, it only allows the light entering the coated mirror to be reflected back out of the coated mirror as only the blue color.



In order to produce this perfectly uniform blue color, the selection of a right type of mirrors that is high quality is critical. For this type of high quality mirrors, we use optical glass because it allows producing clean and spotless mirrors required by the coating process.

SO-GEL NANO coating process uses immersion method. Specifically, the process uses the state of the art equipment to immerse the mirrors in a tank filled with SO-GEL. This allows SO-GEL and the mirrors to have direct chemical reaction. This immersion process is repeated three times but each time a different type of SO-GEL is used in order to get the perfectly uniform blue color. The immersed mirrors also baked and sintered in high temperate to solidify the chemical reaction between the mirrors and the SO-GEL. The hardness of the coated mirrors can reach 7H (the average is 9H)

In contrast, here is the vacuum coating process; unprocessed mirror – cleaning – baking (making the mirror curvature) – coating chrome – coating blue color onto the glasses.

SO-GEL blue mirror process: unprocessed mirror – cleaning (using brushes) – cleaning (using ultrasound) – coating 1 – baking – cleaning (using ultrasound) – coating 2 – baking – cleaning (using ultrasound) – coating 3 – baking – high temperature sintering (around 550°C) – baking (making the mirror curvature more than 700°C)

Blue mirror special features

Light spectrum is made of three major colors (red, green, blue), the soft color that human eyes can easily accept is the blue color. Thus, the development of blue mirrors exists. The blue mirrors that we produce are capable of reflecting about 60% of the blue light, lowering the yellow and red lights that are glaring to human eyes. This provides a great benefit of greatly reducing the strong light coming from the rear cars that produces glaring to drivers who is driving at night. Thus, it reduces danger and increases safety in driving.

Human eyes have limited sensitivity toward light spectrum. There is only a portion of the light spectrum that human eyes can see. For the portion that can be seen, it consists of red, orange, yellow, green, blue, indigo, and purple. The sensitivity of human eyes varies toward these various colors. The sensitivity is low toward blue and purple colors. The sensitivity is high toward the orange and yellow colors, especially in strong light or poor light. For example, the flame that is orange and yellow colors can be seen from 20 to 30 meters away. In contrast, the flame that is blue and purple colors can be ignored within 1 meter.

Blue rear mirrors have the feature of strengthening the blue and purple colors that greatly lowering the sensitivity of human eyes and weakening the orange and yellow lights that human eyes are very sensitivity of. Thus, it creates the color of blue for the rear mirrors, called blue rear mirrors. Blue mirrors that has the feature of lowering glaring and increasing clarity is commonly used in European cars, such as BMW, Mercedes, VW, AUDI, etc. that are considered high end cars.

The majority of cars using halogen light bulbs produce yellow light. SO-GEL NANO blue mirrors are capable of reducing the intensity of yellow light, and thus reducing the glaring to create the dimming effect.

Driving a long period of time under the strong sun, the regular rear mirrors create strong glaring that hurts the human eyes. In contrast, the blue mirrors create clear image that is gentle to human eyes, no glaring. As a result, SO-GEL NANO blue mirrors are very suitable for driving either during the day or night.

The advantages of HSR SO-GEL NANO mirrors :

1. Low reflection and glaring during day or night.
2. Clear images.
3. Hard surface with anti-erosion that does not change color.
4. Perfectly uniform color that provides high quality.