The defects of coated glass and solutions

Off-line(soft coated) magnetron sputter coated glass can be divided into two categories: solar control glass and low e glass. The defects ratios of them are different. The following describes the defects and solutions for these two categories of products.

1. solar control glass,solar reflective glass, common defects and solutions

Solar Control Coated Glass: A coated glass that has a certain control effect on sunlight with a wavelength of 350 to 1800 nm. It has the following drawbacks:

Pinhole: Seen from the transmission direction of the coated glass, the transparent part or all of the film layer has no point-like defects with no adhesion to the film layer; the spot: from the transmission direction of the coated glass, the dot-like defect is darker than the overall color of the film layer. .

1.1 Pinholes and spots are formed by the following factors, and the corresponding solutions are as follows:

1.1.1 The degree of vacuum is not enough, and the adhesion of the film layer is poor. For magnetron sputter coated glass, it should be carried out under high vacuum environment, and the base pressure of the sputtering chamber should reach 4×10-2Pa to effectively coat the coating. If the degree of vacuum is not enough, the film thickness of the batch coating will be weak, and a large amount of block-like light-transmissive areas will appear when
scrubbed with alcohol. In this case, only the base vacuum in the sputtering chamber is increased, and the coating can be performed if the degree of vacuum is enough.

1.1.2 The float glass is not fresh enough, and the adhesion to the film layer is poor. Due to the long storage time or
poor storage conditions of the original film, the surface of the float glass is seriously polluted. Although it is cleaned by deionized water before coating, the surface contamination area cannot be completely removed, and the film structure is not strong when the coating is applied. . In this situation, it is necessary to use fresh original film, and the original film of different manufacturers has different shelf life. Even the original film of the same manufacturer has a great relationship with the season and storage environment. Therefore, for different manufacturers, different seasons have different requirements for the original film, and each coating manufacturer needs to grasp it.

1.1.3 The washing machine has insufficient cleaning ability. The cleanliness of the glass surface directly affects the quality of the coating. During the entire coating production process, the quality control is in addition to the vacuum environment. The most critical step is the cleaning of the cleaning machine. Once the cleaning ability of the washing machine is insufficient, other impurities remaining on the surface of the glass may form spot or block defects. In view of this situation, in addition to improving the performance of the cleaning equipment, the most critical issue is the maintenance of the cleaning equipment, such as whether the conveying roller is clean, whether the water quality meets the requirements, whether there is foreign matter in the air knife, and whether there are too many microorganisms in the water tank. These are all factors that affect the cleaning ability of the washing machine.

1.1.4 Cover, baffle, target slag, which is also a reason for the formation of pinholes. Since the coating production process is not a single production of a variety, when changing between different products, the target materials used are different or different materials will use different power, since the cover plate and the baffle are all metal, there are certain The thermal expansion and contraction, when the thermal expansion and

contraction of the sputter material covering the surface of the expansion coefficient is different from the metal, the formation of cracks, jumping off the surface of the residual glass to form pinholes, spots. In response to this situation, once the cover, the bottom plate, etc. are loaded into the vacuum chamber, it is no longer subjectively controlled by a
person. Therefore, the cover plate and the bottom plate should be thoroughly blasted before the target is placed in the vacuum chamber, and the blasting is performed to discharge the fresh section.
1.2 Scratch: Various linear scratches on the surface of the coated glass, depending on their length, width, position and distribution.
There are two factors in the formation of scratches
and different solutions for different reasons:
1.2.1 Scratch before coating. It is formed before the coating process for various reasons: such as the upper and lower sheets of each process, the transfer between each process, and the like. The formation of such scratches depends only on improving the subjective initiative of the operators and taking measures to actively prevent them.
1.2.2 Scratches during the coating. Caused by each piece of equipment in the coating process. There are obvious rules for scratches in the coating. The scratches must be along the speed direction and are very straight and straight without any inflection points. The scratches in the coating are divided into two types: film surface and glass surface scratching. Most of the film surface scratches are caused by the sinking of the molecular pump cover or the transfer to the gas separation plate. The scratch on the glass surface is mainly caused by too thick or thermal deformation of the T-plate between the bottom plate or the transfer roller. The heavier unpolished glass can be used to reduce or eliminate multiple coatings
in the sputtering chamber.
1.3 Speckle: A cloud-like, radial or streak-like defect that occurs on the surface of the film as seen from the direction of reflection of the coated glass.
There are three main reasons for the formation of markings, and there are different solutions for different reasons.
1.3.1 Cloud-like markings. Mainly due to the lack of freshness of the original film, Na+ extravasation, which is commonly known as mold. Although it has been tempered, it cannot be completely removed, so cloud-like markings are formed. In addition to ensuring the use of fresh original sheets, the expired original sheets (not too long) can be polished with polishing powder and then coated. It can improve the bonding force between the glass and the film layer to
reduce the generation of markings. Of course, the original film expires too long, and the use of polishing powder is also ineffective.
1.3.2 Radial markings, mainly due to the fact that the air knife of the washing machine is not blown clean, and radial streaks appear when the coating is applied. The solution is to adjust the angle of the air knife and ensure that there is no foreign matter in the air knife.
1.3.3 Striped markings. Mainly due to the change of local air pressure in the coating machine, especially the air leakage in the inlet and outlet chambers. Due to the wide range of local air pressure changes, only relying on the experience of each manufacturer and related equipment for leak detection, exclude the rear. Can be produced normally.
1.4 Dark channel: From the direction of reflection of the coated glass, the brightness or reflection of the surface of the film is different from the overall strip-like area, and the degree of visibility depends on the difference in brightness between them and the surrounding film. Most of the dark passages are caused by arcing or tripping of one or more of the cathodes during coating. As long as the arc is avoided and the power supply and cathode are properly operated, the dark passages will not be generated.

2 low-emission coated glass Low-emissivity coated glass, also known as low-emissivity glass, “Low-E” glass, is a coated glass with a high reflectance in the far-infrared range of 4.5μm to 25μm. As a kind of magnetron sputter coated glass, low-emission coated glass will have pinholes, streaks, scratches, dark channels and other defects like the solar control film. It has been explained in the solar control coating and will not be repeated here. However, since offline Low-E is different from sunlight film, most of them are soft films. Therefore, most of the defects are derived from the post coating process after coating, such as post-order oxidation and post-order tempering defects.

2.1 Oxidation after coating: It means that the Low-E glass is oxidized after the coating is completed because the silver in the film is contaminated by water vapor or sulfide in the air. Mainly caused by the following reasons:

(1) The air humidity during production is too high, and the water content in the air is too high, especially during the rainy season. In the south from May to October each year is the season of easy oxidation of Low-E glass. In view of this situation, on the one hand, sufficient desiccant should be used when the glass is packaged, and on the other hand, the time for waiting for insulating production should be shortened as much as possible.

(2) When the sweat is applied to the glass on the glove, the sweat contains a large amount of sulfide, which will react with the silver in the Low-E glass to form black silver sulfide, thereby forming oxidation. . We have experimented with the formation of oxidation in the shortest 1 hour of LoW-E glass that has been adhered to by sweat. Therefore, on the one hand, the gloves are kept dry, and on the other hand, the Low-E glass touched by the sweat is immediately cleaned and the waiting time for hollow production is shortened as much as possible.

(3) Insulated glass(double glazed units) is not handled properly. Improper handling of double glazed units, such as gas leakage, molecular sieve leakage, etc., may cause oxidation of the Low-E glass after the insulating, especially the butyl sealant is not fully filled and the molecular sieve is a fatal threat to the Low-E glass. Therefore, how to improve the quality of double glazed units is a key factor to avoid the 2.2 Post tempering defects: refers to a series of defects in the subsequent processing of tempered Low-E glass. Since the tempered Low-E glass has multiple processes after the coating is completed, the processing flow is as follows: :

The processing of each process may cause damage to the Low-E glass. In the production process, the longer the cycle time, the greater the probability of defects. In addition, since the surface resistances of different Low-E products are different, the heat transfer coefficient is also different. Therefore, the selection of a suitable tempering process is essential to improve the quality of the coating after Low-E glass tempering.

Therefore, in addition to the coating process, the control of the temperable Low-E must be done in accordance with the corresponding measures to reduce the occurrence of defects.

3 Conclusion

Whether it is a solar control film or a low-emission coated glass, as long as the cause of the defect formation is found, it is possible to reduce the occurrence of defects.

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Tags: coated glass, coating process, defect, double glazed units, drawback, FLOAT GLASS, insulated glass, linear scratche, low e glass, low-emission, Low-emissivity, magnetron sputter, molecular sieve, offline Low-E, pinholes, reflective glass, scratch, soft coated glass, solar control glass, solar reflective glass, tempered Low-E, vacuum sputter, washing machine

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From aesthetics, to strict environmental and energy specifications, to critical budget and delivery requirements, our input can make a difference.

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