

Developments in antireflective glass products

After a decade spent perfecting insulating glass, architects and manufacturers are now looking for other ways to enhance their windows' performance – and they are turning to antireflective glass. HY-TECH-GLASS, a 100 per cent subsidiary of Glas Trösch Holding AG, has developed LUXAR®, an antireflective-coated glass (AR-coated glass)

for the visible part of the electromagnetic spectrum.

Its superiority to previous forms of antireflective glass will, according to its manufacturers, give it a wide range of applications.



Side by side comparison of AR picture glass and regular glass

*Volker Herrmann**

GLAS TRÖSCH AG HY-TECH-GLASS

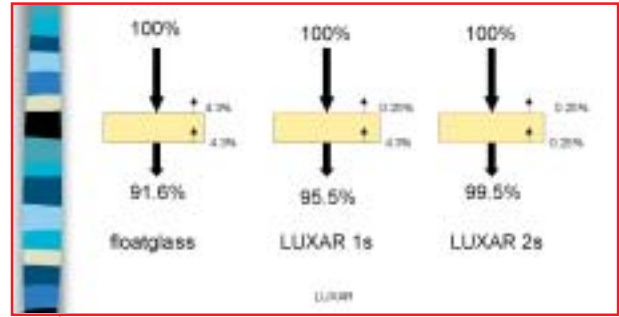
Developments in antireflective glass products

184

INTRODUCTION

To explain the need for antireflective glass (AR glass), it is first necessary to describe the light transmission and reflection qualities of conventional glass.

Reflections occur on the surfaces of substrates with different refraction indexes. The index of refraction of air is one, while the index of refraction of float glass is about 1.5. This difference causes a four per cent reflection at each float glass-air interface. As a piece of glass has two surfaces, it therefore reflects



Single glass

both sides) reduces residual reflection from a single glass pane from over eight per cent to less than 0.5 per cent. This improves the transmission of typical four millimetre float glass to better than 95 per cent. For an insulating glass unit of two AR-coated glass panes (both coated on both sides) transmission increases to 91 per cent. The viewer consequently receives far more light if AR is used.

Looking into AR glass

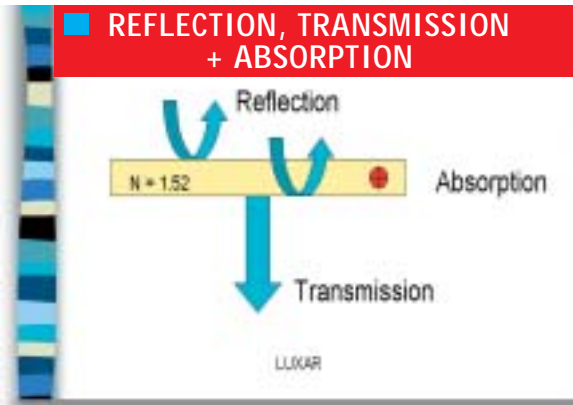
If the viewer and the incoming light are both on the same side of the glass, the amount reflected by a single pane falls from eight per cent to 0.5 per cent. The viewer, therefore, is not distracted by unwanted reflections of his own ghost image. AR provides clear views – you see what you want to see.

MODERN AR GLASS

In the past, the architectural applications of antireflective glass were limited as coatings were soft and were unable to withstand environmental challenges. Newer AR products, however, are manufactured with Magnetron Sputtering technology. This allows the use of materials that give much denser coatings than wet chemical dip processes. Higher density coatings are considerably more durable and resistant to the environment. In fact, in abrasion tests, Magnetron Sputtered AR-coated surfaces perform at least as well as float glass surfaces. This opens the way for many outdoor applications. Glass that has been AR-coated on both sides could now conceivably even be used in automotive applications. In conclusion, AR-coated glass offers the following main advantages over regular glass:

- invisible
 - improved light transmission
 - colour consistency
- light reflection almost zero
almost 10 per cent more
99 per cent

Reflection, transmission and absorption



eight per cent of light. A further small percentage of light, which depends on the glass's thickness and composition, is also absorbed by the glass itself. Typical four millimetre float glass has a transmission of around 88 per cent, which means that 12 per cent of light is lost.

With insulating glass, the loss of light is even more significant. With an insulation glass unit of two layers of un-coated four-millimetre float glass and an air spacing, only 77 per cent of incoming light passes through. Around 15 per cent of this 23 per cent of lost light is reflected.

WHY USE ANTIREFLECTIVE GLASS?

Reflection substantially diminishes the brightness of buildings. This incurs costs and can greatly reduce the visibility of a display room. Antireflective glass is, therefore, very attractive for this and for other applications. Let us consider separately the two cases where AR can be used:

Looking through AR glass

When the viewer and the incoming light are on different sides of the glass, AR (if used on

APPLICATIONS AND MARKETS

There are many fields where antireflective glass could improve products and their performance.

Side by side comparison of regular glass with antireflective glass

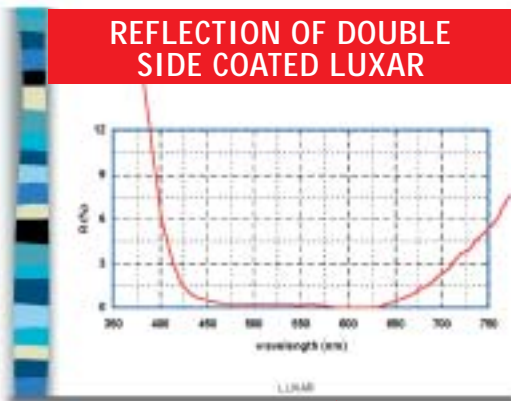


Currently, the six major applications and markets for this type of product are:

- architecture;
- museums;
- picture framing;
- refrigeration;
- information displays;
- the automotive industry and transportation.

Architecture

The greatly enhanced light transmission of AR insulating glass makes it attractive for a wide range of architectural applications. These include storefronts, look-out restaurants, VIP boxes in stadiums, cages in zoos, tanks in aquariums, airport control towers, TV and radio stations, and many more exterior and interior situations. Antireflective glass not only reduces light reflection and improves light transmission, but it also offers low energy emissions (which are legally enforced in a growing list of countries).



Reflection of double-coated LUXAR®

Museums

In museums, AR is mainly used in a laminated form on extra-clear glass for showcases and vitrines, but it is also employed with pictures and paintings in frames. For these uses it is especially important to combine UV-absorption and safety-glass characteristics with non-reflectivity and colour consistency. On laminated low-iron glass, AR can provide clear viewing without compromising security.

Picture framing

Many people like to invest in their home and buy frames and glass for their family photographs or paintings, but they often neglect to purchase appropriate glass.

This might cost less than the frame, yet it can dramatically improve the appearance and visibility of the portrait or photograph.

Refrigeration

Companies in the increasingly competitive retail sector try to make their displays and refrigerators, and the products inside them, more attractive and visible. AR can help by reducing mirror effects and reflections, enabling goods to be seen far beyond their immediate surroundings.

Information displays

The technical applications are in monitors, flat-panel displays and other projection systems where AR coating on one or both sides reduces glare. High-end TV and information-display manufacturers have already recognized the benefits of AR glass. The penetration of antireflective glass into the next generation of TVs and flat-panel displays has therefore begun, and it will be an essential part of their future.

The automotive industry and transportation

In cars, trains and other vehicles, AR on tinted glass can eliminate unwanted light reflections and provide better contrast. Non-reflecting windscreens will also pave the way for new styles of interior design: dashboards, for example, will no longer have to be black.

CONCLUSION

As its performance characteristics make it practical for a wide range of indoor and outdoor applications, antireflective glass could help jump-start new applications in a variety of markets. It will also, of course, help you to see more clearly. ■

***General Manager**
GLAS TRÖSCH - SWITZERLAND

Information Service no. 108
See Contents for Info Service page