PILKINGTON
NSG Group Flat Glass Business

Technical Information

ATS-138
2005/07/18

How Pilkington Energy Advantage™ Low-E Glass Works

Low-E coated glass works in 2 ways: First, it easily transmits the sun's energy because the coating is transparent to this range of radiation (350 to 2500 nm); Second, the Low-E coating has a greatly increased reflection, and greatly reduced emission of long-wave radiation (3 to 50 micrometer, also called Far Infra Red (IR)) compared to uncoated glass, which is opaque to long-wave radiation and is also highly absorptive and highly emissive at these wavelengths.

A room at 70° F radiates energy in the far IR (maximum radiation at around 10 micrometers). Uncoated glass readily absorbs this energy, heats up and radiates heat to the cold exterior in winter. Low-E coatings, because they are electrically conductive, reduce the transfer of this long wave IR energy. (Pilkington **Energy Advantage™** Low-E glass has a Fluorine doped tin oxide coating making it conductive).

If the coating is on the 3rd surface (the exterior side of the room-side light) of a two light insulating glass (IG) unit, it cuts the radiant heat loss to the cold exterior by reducing the radiation or emission, towards the exterior, of the energy absorbed within the room.

If the coating is on the 2nd surface of an IG unit, it controls winter heat loss by reflecting the long wave IR, coming from surface #3, back towards the room. A coating such as Pilkington **Energy Advantage™** Low-E with an emittance of 0.15 has an IR reflection efficiency of 85%, as compared to uncoated glass with only 16%.

The thermal insulation effects of the coating on either #2 or #3 surfaces are identical for winter nighttime heat loss. The two equal window U-Factors (thermal conductivity) show this fact.

It should be noted that heat flows from hot to cold objects. The sun is hot and so its radiant energy will radiate into a room in both summer and winter. In winter this absorbed radiant solar energy will then transfer outwards to the cooler exterior, through plain glass, creating heat loss and high heating fuel charges. Low-E coated glass will reduce this heat loss. In summer, when it is hot outside, there is no heat flow from a cool interior towards a hotter exterior environment. A small amount of heat does come into a room in summer by conduction. Low-E glass, with its reduced U-Factor will reduce this unwanted radiation heat gain.

Finally, the much-quoted greenhouse effect should be carefully understood: A greenhouse with uncoated clear glass gets warm because the absorbed solar radiation within the enclosed space is prevented from escaping by the presence of the glass which blocks air convection currents to the exterior environment. (The radiant heat transfer from the warmed material in the greenhouse to the cool exterior is little altered by the presence of a single light of clear glass.) The use of a Low-E coated glass in a greenhouse creates warmer temperatures within because the radiant heat loss of the absorbed passive solar gain is reduced.

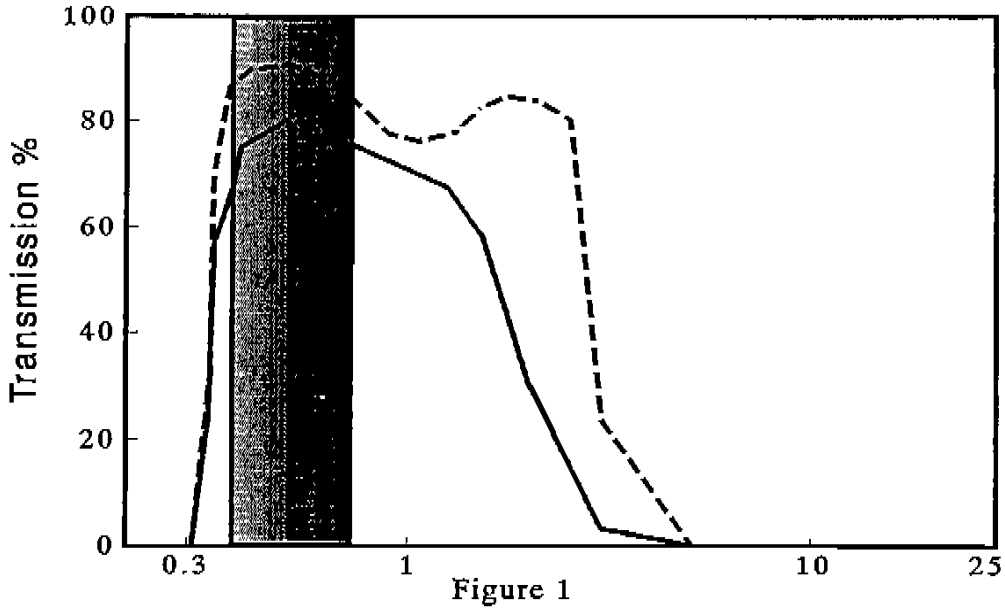

Figure 1

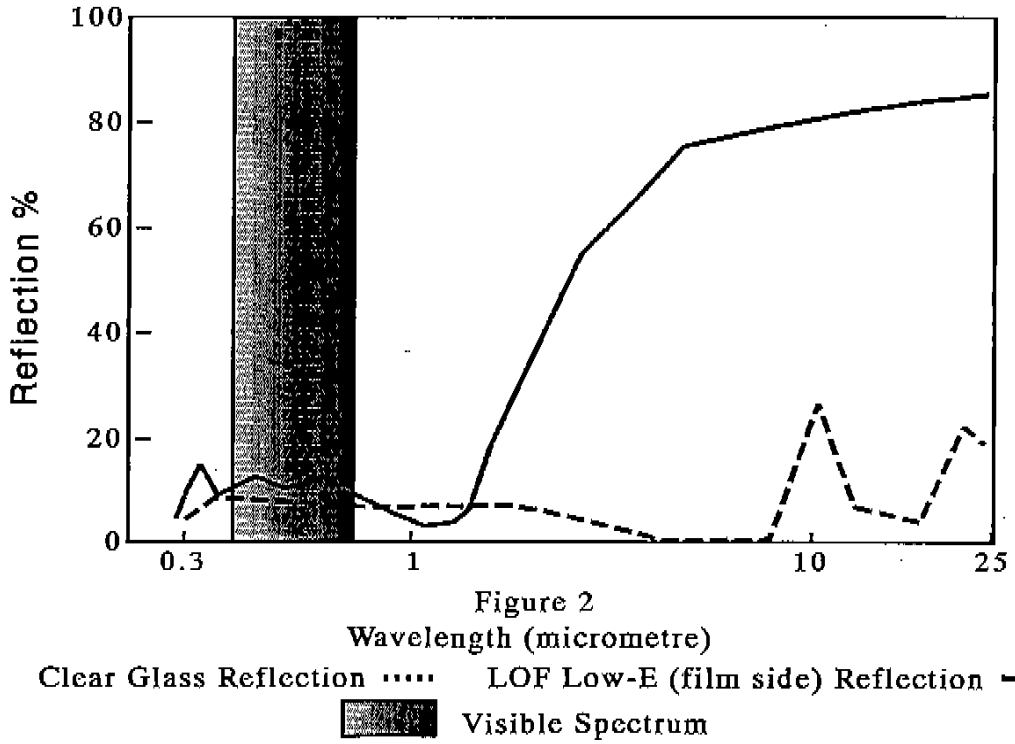

Figure 2

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