Coating Materials News

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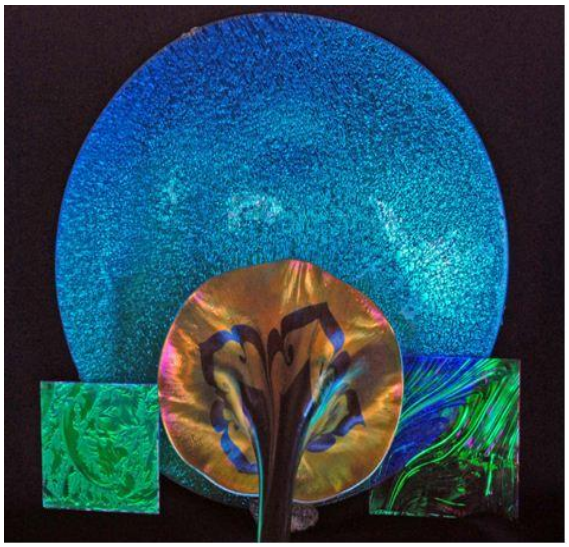
Inorganic Chemicals & Specialty Thin Film Coating Materials

Controlling the Sun's Energy with Thin Film Coatings

The sun delivers 1.36 KW/m^2 at the Earth's surface. This "free" clean energy powers solar and wind electricity generators, sea waves, and solar water heaters. Chlorophyl uses blue wavelengths to produce plant nutrients while reflecting near-IR energy that produces unwanted heating. Millions of square meters of architectural glass control the heating of indoor space - and this is where thin film coatings play an important role. This article will discuss the use of coatings that selectively absorb and reflect different portions of the solar irradiance spectrum, and the deposition processes used for their manufacture.

Spectrally Selective Coating Functions

Visible light has wavelengths between ~400 nm and ~700 nm. Windowglass transmits visible and IR energy to wavelengths as long as ~2.7µm (2700 nm). This spectral range includes about half of the solar radiation, the other half is at longer IR wavelengths. A significant portion of solar IR energy at wavelengths >700 nm is transmitted by glass and is responsible for heating the interior of a building or automobile. While the transmission of IR energy is desirable in colder climates, in warm climates it imposes the need for interior cooling. At wavelengths where glass does not transmit, it absorbs. Thus, at wavelengths longer than 2.7 µm, high absorption causes the glass to heat up and become a black body radiator at 300 K, with maximum radiation neat 10 µm.



Spectrally selective coatings are used to make optical art. Plate with graticulated multi-layer oxide compounds coating resulting in a stress-textured coating (by T. Ives). Squares are multilayer green reflectors on textured glass. Bottom of "Jack in the Pulpet" blown glass vase with chemical thin film, in the style of Louis Comfort Tiffany (Lundberg Studios). Photo by Samuel Pellicori, 2012.

In This Issue

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Face-to-Face ...around Materion

Materion Advanced Chemicals would like to introduce **Andrew Cohen, Product Marketing Manager for Optics and Security** since June 2012. Andrew, who reports to EJ Strother, VP and SBU leader Advanced Chemicals (Milwaukee), is supremely-qualified to support our customers within the optics

Thin-film coatings have been developed for architetural and automotive glass that selectively transmit visible light to interior space while reflecting IR energy that will either escape from, or be transmitted to, the interior space. The control of the flow of solar energy in both directions enables the reduction of heating demands for cold climates and of cooling demands for warm climates, thereby reducing reliance on non-solar based energy sources.

Three function-related types of spectrally selective solar control coatings have been developed and are in use world-wide. They include passive and active constructions:

- Visible-transmitting, IR heat reflecting
- High- / low-emissivity coatings
- Electrochromic and thermochromic coatings that modulate the reflection of IR energy

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Silver's Impact on Energy Initiatives

As the demand for energy continues to increase globally, as well as its cost, many new products are being designed to create, harness, and conserve energy. This is where architectural glass, whether for cold or hot climates, can play a pivotal role in meeting the new initiatives. Most architects design buildings, homes, and offices to have a spacious, light and open look. The advantage of using glass is that it contributes to that appearance by offering outside views and allowing incoming natural light. However, with glass there are also some disadvantages. With it comes the problem of too much energy entering a building or home, and too much energy escaping the same dwelling.

One solution to this dilemma is Low-e (low emissivity) glass. The technology behind Low-e glass involves depositing thin film layers of a variety of metals and oxides onto the sheet of glass. These microscopic depositions, which can be made of different materials, change the properties and performance of the glass to both conserve and deflect energy. In cold climates, Low-e glass conserves heat inside the building and deflects the cold outside, with the opposite happening in warm climates.

This is where silver plays a pivotal role and is one of the most critical layers deposited on the glass. Silver films exhibit infrared properties critical to the reflecting performance of the glass. As window design has evolved over time, companies continue to use more silver layers on an increasing number of glass panes. This silver is sputter-deposited on the glass during the manufacturing process. This has significantly enhanced the energy performance of advanced glass products which are used in almost all new construction.

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initiatives for large area coatings. With a Degree in Electrical Engineering from the Univ.of Johannesburg, and a multi-faceted work background in product, operations and sales management, Andrew brings extensive international expertise to Materion. His previous experience included a broad range of product management in fields as diverse as electronic security to the medical industry. Read more...

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