Coating Material **News**

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Practical Aspects of Infrared Technology

In This Issue

Our June issue outlined the vast field of infrared technology and the role that coating materials and processes play in enabling that technology. We reviewed the IR spectrum, applications by spectral region, user disciplines, and coating and substrate materials. Several messages were intended as take aways; one is that different portions of the IR spectrum, which stretches from the Near IR beginning at ~800 nm to the thermal IR out to 14 µm (LWIR), employ specific transparent coating materials. Special applications that require operation to wavelengths longer than 50 µm involve an even different set of materials for transparency. We distinguished between sensing reflected IR energy in the NIR and SWIR solar energy regions, from sensing thermal emission at longer wavelengths. As more sensitive cooled and non-cooled detectors and IR imaging materials are developed, more applications are being introduced and satisfied. Therefore, in addition to the previously dominant military application market, IR imaging devices are being applied today to medical, scientific, and even automotive devices.

Figure 1 - Infrared Applications Know No Bounds! Evidenced by this Hubble IR image of a nebula agitated by a young aggressive star. Photo Credit: NASA/ESA/Hubble

Earth's atmosphere provides windows through which IR energy is transmitted. Water and CO2 absorption occurs between these NIR, MWIR, and LWIR bands. Figure 2 shows the transmitted energy wavelength regions for the atmosphere. Clear and water bands are evident. IR instruments, depending on their functions, are designed to operate in the transmitted regions. Remote sensors for DoD, NOAA, and NASA missions operate in the "water free" bands. Medical systems are not restricted by atmospheric absorptions.

The ever-expanding range of applications requires mature coating materials preparation and deposition technology. In this issue, we explore more detailed process parameters. The reader is referred to Tables 2 and 3 of the June 2012 CMN issue where IR coating materials properties were listed.

Lenses and windows used for the short wave (SW) and long wave (LW) thermal IR range, including the span 3 to 14 µm, are silicon, germanium, zinc sulfide (ClearTranÔ), ZnSe, CaF2 and more recently calcogenides. Additional materials to cover the SW region are included in Table 1 below.
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Materion's Inorganic Chemicals catalog provides a wide variety of materials from Aluminum to Zirconium including Borides, Carbides, Phosphor, Oxides, Silicides, and Thorium compounds.

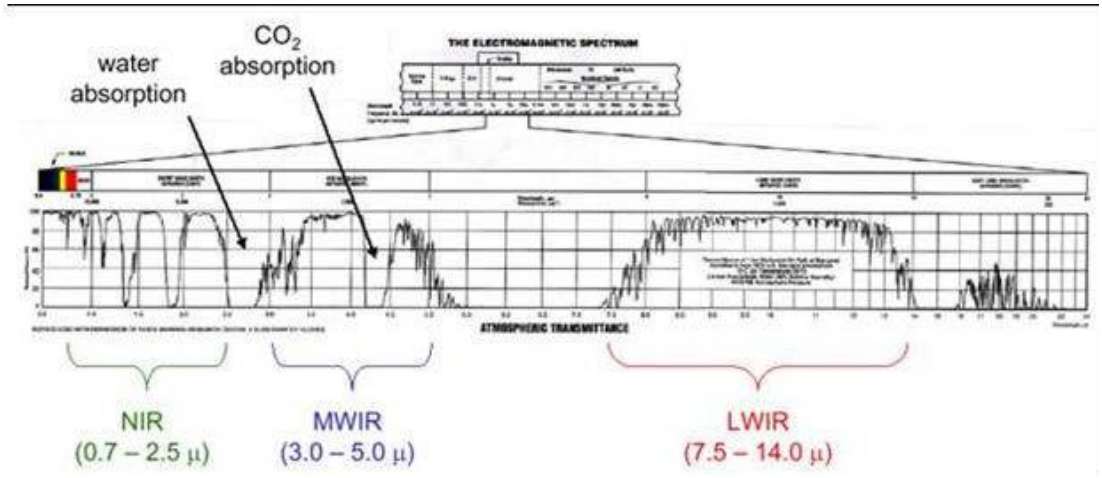

Figure 2 - Transmitted energy wavelength regions for the atmosphere.

Inorganic Chemical Catalog

Challenge of Phosphor Sensitivity

There is a growing demand for phosphors, particularly for use in backlighting in the LED industry. The challenge for the supplier is working with tricky compounds that are air (oxygen) and moisture sensitive. Materion Advanced Chemicals is an industry leader in controlled atmosphere material handling and packaging, with our strength in meeting the difficult demands for stable product. While Materion does not provide the actual phosphors, it supplies materials that are a pre-cursor to phosphors. Particularly challenging to the manufacturing process is that these powders decompose in ambient atmosphere. In order to maintain product integrity, which is more stringent than quality alone, the materials must be produced in low levels of moisture and oxygen, then carefully packaged in a manner that will maintain the product's properties. The customer NEEDS to receive the exact product created under the correct conditions across all batches with total consistency. Product integrity and consistency across batches are critical to the customer's quality requirements.

To ensure the product is not compromised by the environment, Materion has developed an Air Sensitive Materials Packaging System, designed to achieve maximum product shelf life. At Materion, the product's initial container is topped with a Teflon-lined cap and is packed under Argon into a vacuum-sealed inner bag. Inside that bag is a desiccant pack for additional moisture protection. (See Figure 1.) This process is then repeated.

The clear inner sealed bags with the desiccant are then further vacuum sealed in a foil bag. (See Figure 2.) This exceptional packaging approach ensures the customer will receive consistent product quality with each shipment.
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