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WHITE PAPER: Optical Components for SWIR Imaging

by Precision Glass & Optics, Geneva Ave, CA
www.pgandoptics.com

As a manufacturer of turnkey optical solutions, including coatings that range from 400-2000 nm, visible and not to near infrared wavelengths, Precision Glass & Optics (PG&O) is acutely aware of the challenges that face light imaging components. The many applications in both of low light environmental conditions (nighttime, fog, smoke, water vapors, etc.) devices operating in the middle range of light wavelengths require a high quality optical coating of uniform lighting and high thermal stability. The challenges in coating high quality lenses can be overcome by using the techniques of SWIR coating technology. Light sources in the short wave, midwave, and long wave infrared ranges are used to illuminate the target area. However, when used in this way, SWIR imaging is often limited by the detector's spectral response for the object of interest. While this is a challenge in applications where the detector or object is visible, SWIR can be used in applications where the detector or object is not visible. SWIR can be used to detect and identify objects in a specific range of wavelengths of light, or the object is reflected, refracted, and absorbed by an object and produces light images with a strong infrared and high resolution. The SWIR light source may be infrared light emitted by the sun, moonlight, starlight, or lightbulbs. The visible SWIR range is from approximately 1.1 to 2.0 µm, which is higher than the near infrared range of 0.7 to 1.4 µm, and is more suited to low level water vapors, fog and smoke, and laser. From the infrared wavelength band of 2.0 to 3.0 µm, and therefore can image through such conditions with greater detail. The technique you might be able to use to detect an object is a long wave infrared (LWIR) detector with 10 to 15 µm or to detect using MWIR or LWIR. Using SWIR, it is likely the detector through could be used to identify whether the particle is carbon dioxide or a fire.

Most of the optical materials used for components that operate in the visible range - glasses and many plastics - are also transparent in the SWIR range. Therefore, in the SWIR spectral range, optical components are fabricated from materials with the same techniques as conventional, but use components used in the visible range. However, because they have been optimized for visible light and imaging performance, SWIR optical components are not necessarily designed.

Advantages to SWIR imaging devices include the availability of high sensitivity and resolution with small size. These unique features make the short wave infrared wavelength detectors ideal for many other applications, including:

- Electronic beam inspection
- Laser beam analysis
- Size cell inspection
- Night spectral imaging
- Precision inspection
- Range photometry
- Spectral response
- Sensitivity inspection
- Identifying and sorting

Precision Glass & Optics | tel: +1 714 940-0246 | info@pgandoptics.com | www.pgandoptics.com

"Optical Components for SWIR Imaging"

Precision Glass & Optics discusses the challenges of designing optical coatings for shortwave infrared (SWIR) imaging. Also discussed are the many advantages that SWIR imaging devices provide.

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