Decorative Near-Infrared Transmission Devices

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Understanding and harnessing infrared light has enabled society to sense and perform things not previously attainable. With a wavelength just longer than that of visible light, infrared radiation cannot be seen with the naked eye but holds valuable information for innumerable applications, for example: night vision, spectroscopy, imaging/photography, communications, and even decorative displays. The development of filters that block visible light and other forms of electromagnetic radiation but allow the passage of near-infrared (NIR) light have invaluable utility.

## Limitations of current NIR filters

Many NIR filters rely on organic dyes or pigments to absorb visible/UV light but suffer from limitations due to photo and environmental instability. Another limitation to other stable NIR filter options is the high cost and inefficiency of manufacturing, leading to non-conducive scale-up.

## Highly efficient and scalable NIR passing filter

This NIR transmission filter uses one-dimensional photonic crystal to absorb visible light, while allowing infrared light to pass through. This structure relies on stacking seven layers of photonic crystals and semiconductor materials that allows for the reflection of a desired color. This reflection of colored light enables the hiding of objects behind said filters without disrupting transmission efficiency (~100%). The other notable advantages are high-angle invariant properties that produce mirror-like images over a wide-angle range, along with the requirement of only a thin film deposition layer for fabrication, which is highly amenable to scale-up manufacturing. This filter can be applied across the broad $880M market segments of infrared devices.

## Applications

* Near infrared decorations
* Optical detectors
* Security devices
* Image capture/photography

## Advantages

* Thin layer deposition for cost-effective manufacturing
* Decorative light features
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