



# Organic Photodetector Design Provides Tunable Spectral Response (20110144, Dr. Russell Holmes)

**IP Status:** Issued US Patent; **Application #:** 13/929,028

## Multiple Photodetectors in Stacked Architecture

A new architecture for organic photodetectors uses multiple layers to provide a tunable response specific to the wavelength of interest. The single-device design, which uses multiple organic photodetector subcells in a stacked/tandem architecture, uses organic semiconductors with complementary optical absorption for broadband optical response. The device permits a tunable spectral response in various spectrums, and the response from each individual active compound material can be separately tuned. The optical responsibility of the organic photodetector can be broadband, spanning the ultraviolet, visible, and near-infrared. The devices can be engineered with independent, user-specified responsivity in both visible and infrared. This lower cost, high throughput design is suitable for large area detectors, night vision, detectors for instrumentation, etc.

## Technology ID

20110144

## Category

Engineering & Physical Sciences/Instrumentation, Sensors & Controls

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## High Throughput Processing, Less Expensive, Lightweight

Traditional photodetectors, made from silicon or other inorganic semiconductors, can be expensive, difficult to make, and may suffer from stability issues (especially for large surface area applications). Because of their fabrication methods, these devices are limited to planar surfaces and are not compatible with high throughput processing. Organic photodetectors have been developed but are limited to a specific narrow wavelength and are not easily tunable to a specific application. This new, high-throughput design offers several advantages over current photodetector design (both traditional and organic). They have broad, highly tunable absorption spectra with large absorption coefficients, are compatible with large areas, are lightweight and can be deposited on curved surfaces.

## **BENEFITS AND FEATURES:**

- Broad, highly tunable absorption spectra with large absorption coefficients
- Compatibility with large areas
- High throughput processing
- Ability to be deposited on curved surfaces
- Lightweight

## **APPLICATIONS:**

- Military
- Photoconductors and charge-coupled devices
- Receivers for remote control devices
- Flexible displays
- Night vision equipment
- Camera sensors
- Photoconductors, charge-coupled devices, and photomultiplier tubes
- Enhanced vision systems (EVS) in aircraft
- Active pixel sensors for cameras
- Cryogenic particle detectors
- Infra remote control for television sets, DVD players and home theater systems
- Organic photovoltaic cell (OPVC)

**Phase of Development** - Proof of concept. Built and tested 3-layer multiband photodetector.

## **Researchers**

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[External Link](http://www.cems.umn.edu) (www.cems.umn.edu)

## **Publications**

[\*Directing Energy Transport in Organic Photovoltaic Cells Using Interfacial Exciton Gates\*](#)

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