



Extremely Broadband High-speed Photodetector

Background

High-speed photodetectors operate in a relatively narrow wavelength range. Conversely, extremely broadband detectors suffer from slow response speed. A UW research team has developed a photodetector with both broadband detectivity and high-speed operation. Optical measurements with high spatial resolution beyond the diffraction limit is generally difficult, requiring complex near-field microscopes. By miniaturizing the detectors, a new simpler route for sub-diffraction limit measurements was developed.

Description of the invention

This is a sensor that has a very broad range of detection and a very rapid response time, a combination that is quite unique.

While there are other sensors that may target a specific range, this sensor has the capability to cover a very broad photodetection range from mid-infrared (MIR) to deep-ultraviolet (DUV).

The sensor accomplishes this by combining two semiconductors with different light response ranges (black phosphorus and 2H-MoTe₂) in a unique vertical geometry to produce a broadband sensor with a high response bandwidth of 2.2 MHz.

Advantages

This new sensor has the following advantages:

- Room temperature operation
- High speed operation
- High sensitivity / detectivity
- Wide spectral range operation from mid-infrared (MIR) to deep-ultraviolet (DUV)
- Reduction of the number of sensors needed for multiple readings in different ranges.

Potential applications

This new sensor may be used anywhere that traditional sensors are used, including:

- Optical communications
- Remote sensing / security / defense
- Process control
- Environmental monitoring
- Spectroscopy
- Astronomy / space
- Applications as a single point or area sensor

Reference

10218

Patent status

Patent application filed

Stage of development

Prototype
Ongoing research

Contact

Scott Inwood
Director of Commercialization
Waterloo Commercialization Office
519-888-4567, ext. 43728
sinwood@uwaterloo.ca
uwaterloo.ca/research