



Infrared Detectors And Heat Recycling Cells Based On Metallo-Graphene Nanocomposites

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SUMMARY

UCLA researchers in the Department of Electrical Engineering have developed a high-responsivity photodetector that utilizes metallo-graphene nanocomposites for superior detection of infrared wavelengths.

BACKGROUND

Infrared photodetectors are key tools used in multiple applications ranging from medical thermography (detecting irregular blood flow) to building inspections (determining efficiency of heat insulation). Continuous improvements are being made to device detection bandwidths, sensitivity, and responsivity. Currently, graphene is becoming an appealing candidate for the development of infrared photodetectors due to its low-cost nature and ability to generate photocarriers across a broad spectral range. However, their use has been limited by tradeoffs among responsivity, operation speed, and broadband.

INNOVATION

UCLA researchers have developed a novel photodetection system using gold-patched graphene nanoribbons. This system, unlike previous graphene photodetectors, does not utilize quantum dots and defect states, effectively bypassing limitations on bandwidth and responsivity, increasing response time by seven orders of magnitude and bandwidths by one order of magnitude. This novel photodetector is capable of ultrabroad operation bandwidth from the visible (800nm wavelength) to infrared (20µm wavelength) while maintaining a high responsivity level (0.6-8 A/W). In addition, the specific design of the gold-patched graphene nanoribbons allows for ultrafast photodetection.

APPLICATIONS

- ▶ Night vision
- ▶ Hyperspectral imaging and sensing
- ▶ Heat recycling cells
- ▶ Thermal imaging cameras
- ▶ Medicinal thermal imaging (detection of blood flow)

ADVANTAGES

- ▶ Higher responsivity levels compared to previously reported graphene photodetectors
- ▶ Faster response times (more than seven orders of magnitude) compared to photodetectors based on quantum dots and tunneling barriers
- ▶ Broader bandwidths, despite high speed
- ▶ Lower cost compared to current state of the art
- ▶ Can be applied universally to various metallic nanostructure geometries

STATE OF DEVELOPMENT

- ▶ The researchers have developed a proof-of-concept device.

PATENT STATUS

Country	Type	Number	Dated	Case
Germany	Issued Patent	3635752	12/27/2023	2017-786

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INVENTORS

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OTHER INFORMATION

KEYWORDS

infrared, photodetector, graphene,
radiation, thermal imaging,
hyperspectral imaging

CATEGORIZED AS

- ▶ **Optics and Photonics**
 - ▶ All Optics and Photonics
- ▶ **Nanotechnology**
 - ▶ Tools and Devices
- ▶ **Sensors & Instrumentation**
 - ▶ Physical Measurement

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