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Title: Detector useful in image sensor for detecting terahertz radiation, comprises micro-plasma cell with cavity, and read-out electronics connected to cell to measure changes electron density with respect to bias provided electron density

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Abstract: NOVELTY - The detector comprises a micro-plasma cell (1) with a cavity (5) comprising a plasma in operation when applying a bias to the micro-plasma cell, read-out electronics (20) connected to the micro-plasma cell for measuring changes an electron density in the plasma in the micro-plasma cell with respect to bias provided electron density, and a radiation source for irradiating the plasma in the micro-plasma cell. The cavity comprises a gas composition near atmospheric pressure or higher, where the gas composition comprises a Penning mixture.

USE - The detector is useful in an image sensor for detecting terahertz radiation (claimed), where the sensor is useful for industrial applications including product inspection on conveyor-belts, medicine, communication, homeland security and space technology.

ADVANTAGE - The detector is capable efficiently and economically detecting the terahertz radiation with high sensitivity and signal-to-noise ratio.

DETAILED DESCRIPTION - The detector comprises a micro-plasma cell (1) with a cavity (5) comprising a plasma in operation when applying a bias to the micro-plasma cell, read-out electronics (20) connected to the micro-plasma cell for measuring changes an electron density in the plasma in the micro-plasma cell with respect to bias provided electron density, and a radiation source for irradiating the plasma in the micro-plasma cell. The cavity comprises a gas composition near atmospheric pressure or higher, where the gas composition comprises a Penning mixture. The Penning mixture comprises a main inert gas, and a quench gas having a lower ionization potential than the main inert gas. The micro-plasma cell comprises a first electrode, a second electrode (4), and a substrate provided with a thin film first electrode, a dielectric layer and a conductive second electrode layer, where the first electrode is a tuned electrode. The tuned electrode comprises: a metamaterial, which forms a periodic structure that compromises highly conductive materials and/or shaped metals such as graphene, gold or copper; split ring resonators; and metamaterial structures with layers stacked on top each other and spaced by a dielectric. The periodic structure has structural features that are smaller than a wavelength terahertz radiation. The electrodes are grouped into a single image pixel, and are isolated from the cavity. The micro-plasma cell is driven by a direct current bias and an alternating current bias unit, and the read-out electronics comprise direct current-bias decoupling components and a network analyzer. The dielectric layer is provided with an aperture above the thin film first electrode. The conductive second electrode layer comprises apertures above the cavity, and a material transparent to radiation having a wavelength 50-3000 mu m. INDEPENDENT CLAIMS are included for:

(1) a method detecting terahertz radiation; and

(2) an image sensor.

DESCRIPTION DRAWING(S) - The diagram shows a schematic view a detector.

Micro-plasma cell (1)

Insulating material (3)

Second electrode (4)
Cavity (5)
Read-out electronics. (20)
Drawing:
Derwent Class Code(s): U13 (Integrated Circuits); V05 (Valves, Discharge Tubes and CRTs)
Derwent Manual Code(s): U13-A01; V05-H
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Cited Patent(s):
WO2012078043-A1 US2004100194-A1 EDEN J G (EDEN-Individual); PARK S (PARK-Individual) EDEN J G; PARK S
Cited Article(s):
WO2012078043-A1 "Penning Mixture", Wikipedia , 13 August 2011 (2011-08-13), XP002668200, Retrieved from the Internet: URL:http://en.wikipedia.org/w/index.php?title=Penning_mixture&oldid=444686370 [retrieved on 2012-01-27]
H.O. MOSER ET AL: "3D THz metamaterials from micro/nanomanufacturing", LASER & PHOTONICS REVIEWS, 19 September 2011 (2011-09-19), pages 1-26, XP55017815, ISSN: 1863-8880, DOI: 10.1002/lpor.201000019
NABIL H. FARHAT: "Optimization Millimeter-Wave Glow-Discharge Detectors", PROCEEDINGS THE IEEE, vol. 62, no. 2, 1 February 1974 (1974-02-01), pages 279-281, XP55017772, ISSN: 0018-9219