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Graphene controlled organic photodetectors

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SYNTHETIC METALS

Volume: 217 **Pages:** 43-56
DOI: 10.1016/j.synthmet.2016.03.015
Published: JUL 2016
[View Journal Impact](#)

Abstract

Drop casting deposition technique was used to fabricate graphene oxide doped methylene blue (GO doped MB) photodiode, Al/p-Si/GO doped MB/Au. The effects of illumination on the current voltage (I-V) characteristics of the Al/p-Si/GO doped MB/Au Schottky diode for optical sensing applications were explored. The reverse current of the diode in the reverse bias increases with the increasing illumination intensities. The obtained trends for both ideality factor and barrier height are in agreement, suggesting that they are both affected by GO doping. The photosensitivity of the photodiodes was investigated. The highest photosensitivity was observed for the diode having 0.03 GO:MB ratio with I-photo/I-dark ratio of 8.67 x 10(3) at 100 mW/cm(2) under 10 V. The rectification ratio was of the order of 10(4). In addition, the capacitance voltage (C-V) and conductance voltage (G-V) measurements of the diode were studied in the frequency range of 10 kHz-1 MHz. The measured values of the capacitance decrease with the increasing frequency. The decrease in capacitance was explained on the basis of interface states. The photoelectrical properties of Al/p-Si/GO doped MB/Au devices indicate that the prepared diodes can be used both as a photodiode and a photocapacitor in optoelectronic device applications. (C) 2016 Elsevier B.V. All rights reserved.

Keywords

Author Keywords: Solar energy materials; Photodiode; Graphene oxide; Methylene blue
KeyWords Plus: SOLAR-CELL APPLICATIONS; ELECTRICAL CHARACTERIZATION; OXIDE; PHOTODIODES; CONTACT; FILMS; CAPACITANCE; JUNCTIONS; DEVICES; BARRIER

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Funding

Funding Agency	Grant Number
Deanship of Scientific Research at KFUPM	IN141009
King Saud University	

[View funding text](#)

Publisher

ELSEVIER SCIENCE SA, PO BOX 564, 1001 LAUSANNE, SWITZERLAND

Categories / Classification

Research Areas: Materials Science; Physics; Polymer Science

Web of Science Categories: Materials Science, Multidisciplinary; Physics, Condensed Matter; Polymer Science

Document Information

Document Type: Article

Language: English

Accession Number: WOS:000378957600007

ISSN: 0379-6779

Journal Information

Table of Contents: [Current Contents Connect](#)

Impact Factor: [Journal Citation Reports](#)

Other Information

IDS Number: DQ1JP

Cited References in Web of Science Core Collection: **53**

Times Cited in Web of Science Core Collection: **5**