Dynamic charge transport in pentacene and zinc oxide thin-film transistors: Dark and UV illumination conditions

By: Mansouri, S (Mansouri, S.)[1] ; Bourguiga, R (Bourguiga, R.)[1] ; Al-Ghamdi, AA (Al-Ghamdi, A. A.)[2] ; Al-Hazmi, F (Al-Hazmi, Faten)[2] ; Al-Hartomy, OA (Al-Hartomy, Omar A.)[2,3] ; El-Tantawy, F (El-Tantawy, Farid)[4] ; Yakuphanoglu, F (Yakuphanoglu, F.)[5]

View ResearcherID and ORCID

SYNTHETIC METALS
Volume: 162 **Issue:** 17-18 **Pages:** 1681-1688
DOI: 10.1016/j.synthmet.2012.06.024
Published: OCT 2012
View Journal Impact

Abstract

The electronic charge transport of thin film transistors (TFTs) based on pentacene and zinc oxide semiconductors was studied. A mathematical model is presented based on the variable range hopping (VRH) transport theory. Using the VRH model, the expression of source drain current is established under dark and under UV illumination (365 nm) in linear regime for drain bias V-D = 2 V and 2 V, when we used pentacene and zinc oxide, respectively, at 300 K. All electrical key parameters of TFTs based on pentacene and zinc oxide were extracted. A good agreement between theoretical model and experimental measurement, transfer characteristics was obtained under dark and UV illumination conditions. Finally, we give a simple small-signal equivalent circuit to the organic and inorganic thin film transistor. (c) 2012 Elsevier B.V. All rights reserved.

Keywords

Author Keywords: Organic-inorganic TFTs; VRH model; Dynamic charge transport model; Effect of UV illumination

KeyWords Plus: CURRENT-VOLTAGE CHARACTERISTICS; FIELD-EFFECT TRANSISTORS; LIGHT-EMITTING-DIODES; EXTRACTING PARAMETERS; ORGANIC TRANSISTORS; ANALYTICAL-MODEL; EFFECT MOBILITY; ANALYTIC MODEL; ZNO; CONDUCTIVITY

Author Information

Reprint Address: Mansouri, S (reprint author)

+ Fac Sci Bizerte, Grp Phys Composants & Dispositifs Nanometr, Lab Phys Mat Struct & Proprietes, Jarzouna Bizerte 7021, Tunisia.

Addresses:

+ [1] Fac Sci Bizerte, Grp Phys Composants & Dispositifs Nanometr, Lab Phys Mat Struct & Proprietes, Jarzouna Bizerte 7021, Tunisia

+ [2] King Abdulaziz Univ, Dept Phys, Fac Sci, Jeddah, Saudi Arabia

[3] Tabuk Univ, Dept Phys, Fac Sci, Tabuk 71491, Saudi Arabia

+ [4] Suez Canal Univ, Dept Phys, Fac Sci, Ismailia, Egypt

+ [5] Firat Univ, Dept Phys, Fac Sci, TR-23169 Elazig, Turkey

E-mail Addresses: mansourislah@yahoo.fr

Funding

Funding Agency	Grant Number
Tunisian Ministry of High Education	

View funding text

Citation Network

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:000309488200031

ISSN: 0379-6779

Journal Information

Table of Contents: Current Contents Connect

Impact Factor: Journal Citation Reports

Other Information

IDS Number: 015ZY

Cited References in Web of Science Core Collection: 44

Times Cited in Web of Science Core Collection: 4