Author's Accepted Manuscript

AC electrical conductivity and dielectric relaxation studies on n-type organic thin films of N, N'-Dimethyl-3,4,9,10-perylenedicarboximide (DMPDC)

Saleem I. Qashou, A.A.A. Darwish, M. Rashad, Z. Khattari



www.elsevier.com/locate/physt

PII: S0921-4526(17)30528-8

DOI: http://dx.doi.org/10.1016/j.physb.2017.08.043

Reference: PHYSB310183

To appear in: *Physica B: Physics of Condensed Matter*

Received date: 14 June 2017 Revised date: 22 July 2017 Accepted date: 18 August 2017

Cite this article as: Saleem I. Qashou, A.A.A. Darwish, M. Rashad and Z. Khattari, AC electrical conductivity and dielectric relaxation studies on n-type organic thin films of *N*, *N'*-Dimethyl-3,4,9,10-perylenedicarboximide (DMPDC), *Physica B: Physics of Condensed Matter*, http://dx.doi.org/10.1016/j.physb.2017.08.043

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

AC electrical conductivity and dielectric relaxation studies on n-type organic thin films of N, N'-Dimethyl-3,4,9,10-perylenedicarboximide (DMPDC)

Saleem I. Qashou¹, A.A.A. Darwish^{1,2}, M. Rashad^{1,3,*}, Z. Khattari⁴

Abstract

Both Alternating current (AC) conductivity and dielectric behavior of n-type organic thin films of *N*, *N'*-Dimethyl-3,4,9,10-perylenedicarboximide (DMPDC) have been investigated. Fourier transformation infrared (FTIR) absorption spectroscopy is used for identifying both powder and film bonds which confirm that there are no observed changes in the bonds between the DMPDC powder and evaporated films. The dependence of AC conductivity on the temperature for DMPDC evaporated films was explained by the correlated barrier hopping (CBH) model. The calculated barrier height using CBH model shows a decreasing behavior with increasing temperature. The mechanism of dielectric relaxation was interpreted on the basis of the modulus of the complex dielectric. The calculated activation energy of the relaxation process was found to be 0.055 eV.

Keywords: Organic materials; thin films; AC conductivity; complex dielectric modulus

1. Introduction

Perylene-based organic dye is one of the organic semiconductor materials which have drawn wide attentions not only due to their strong electron accepting and a fast electron transporting properties but also due to their special chemical and thermal stability [1, 2]. Efforts were being made to study perylene derivatives and promoting their properties to combine potential devices into all plastic integrated circuits which are widely used in the application fields of organic electronics and optical devices [3-8]. The *N*, *N'*-Dimethyl-3,4,9,10-perylenedicarboximide (DMPDC) is one of perylene derivatives, which its molecular structure is given in **Fig. 1.** This material is an air-stable n-type organic semiconductor and exhibits high thermal stability [9].

¹Nanotechnology Research Laboratory, Department of Physics, Faculty of Science, University of Tabuk, Tabuk, Saudi Arabia

²Department of Physics, Faculty of Education at Al-Mahweet, Sana'a University, Al-Mahweet, Yemen

³Department of Physics, Faculty of Science, Assiut University, Assiut, Egypt.

⁴Department of Physics, Faculty of Science, Hashemite University, Jordan.

^{*}Corresponding author. Tel: +966-556061705. mohamed.ahmed24@science.au.edu.eg

Download English Version:

https://daneshyari.com/en/article/5491682

Download Persian Version:

https://daneshyari.com/article/5491682

<u>Daneshyari.com</u>