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Effects of the graphene doping level on the optical and electrical properties of ITO/P3HT:Graphene/Au organic solar cells

By: [Bkakri, R](#) (Bkakri, R.)^[1]; [Sayari, A](#) (Sayari, A.)^[2,3]; [Shalaan, E](#) (Shalaan, E.)^[4]; [Wageh, S](#) (Wageh, S.)^[4,5]; [Al-Ghamdi, AA](#) (Al-Ghamdi, A. A.)^[4]; [Bouazizi, A](#) (Bouazizi, A.)^[1]

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Abstract

The effects of the graphene doping level on the optical and electrical properties of ITO/P3HT:Graphene/Au solar cells are investigated. The spectroscopic ellipsometry (SE) analysis proves that the insertion of low graphene content in the P3HT matrix reduces the optical bandgap of the P3HT:Graphene nanocomposite and the thickness of the film. As a result the optical absorption properties of the device are enhanced in the visible range. The device elaborated with the lower graphene content displays a $J(SC) = 9.93 \times 10^{-4} A/cm(2)$, a $I_f V-OC = 0.55 V$ and $FF = 41\%$, under illumination. These results are in good agreement with the SE analyzes since the device elaborated with the lower graphene content exhibits the higher optical parameters. The origin of the improved energy conversion efficiency for low graphene doping level is discussed in this work. (C) 2014 Elsevier Ltd. All rights reserved.

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Author Information

Reprint Address: Bkakri, R (reprint author)

+ Fac Sci Monastir, Lab Matiere Condensee & Nanosci, Equipe Dispositifs Elect Organ & Photovoltar Mol, Ave Environm, Monastir 5019, Tunisia.

Addresses:

- + [1] Fac Sci Monastir, Lab Matiere Condensee & Nanosci, Equipe Dispositifs Elect Organ & Photovoltar Mol, Monastir 5019, Tunisia
- + [2] King Abdulaziz Univ, Fac Sci, Dept Phys, North Jeddah Branch, Jeddah 21589, Saudi Arabia
- + [3] Fac Sci Tunis, Dept Phys, Equipe Spect Raman, Tunis 2092, Tunisia
- + [4] King Abdulaziz Univ, Fac Sci, Dept Phys, Jeddah 21589, Saudi Arabia
- + [5] Menoufia Univ, Fac Elect Engn, Phys & Engn Math Dept, Menoufia 32952, Egypt

E-mail Addresses: bkakrirabeb@hotmail.com

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