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Photovoltaic effect observed in junctions based on Buriti oil

E. R. da Silva*, A. M. Ceschin

(1) Departamento de Engenharia Elétrica - Laboratório de Dispositivos e Circuito Integrado, Universidade de Brasília, CP 4386, CEP 70904-970 Brasília DF – Brasil, e-mail: elizsilva@unb.br
* Corresponding author.

Abstract - We decide to investigate the Buriti oil mixtures in solar cells fabrication. The samples consist of an active layer (mixture of Buriti oil with PS or PMMA) sandwiched between two electrodes (PEDOT:PSS and Ag). The samples were subjected to direct irradiation solar light and its V_{oc} and I_{sc} were measured. The *I-V* curves were obtained in the lit room and the dark. We can observe the photovoltaic effect in all samples.

Organic photovoltaic devices have attracted considerable attention because of their potential for use in low-cost, lightweight, solution- processable and flexible large-area panels [1]. Each polymer has unique properties and responds differently to different stimulus. However, its characteristics can be improved by blending two polymers or by addition of some compounds called additives, producing interesting results. As an example we can take the Buriti oil mixed in polystyrene (PS) or mixed in the Poli(metacrilato de metila) (PMMA). These modified materials show a very broad absorption between 250 to 400 nm with a maximum at 320 nm [2]. This makes it a promising candidate for photovoltaic studies. Based on this result we decide to investigate the Buriti oil mixtures in solar cells fabrication.

The samples were assembled on the glass substrates covered with fluorine-doped tin oxide (FTO). The active layers were sandwiched between two electrodes: the bottom electrodes consist of a film of poly (3, 4-ethylene dioxythiophene: poly(4-styrene sulfonate) (PEDOT: PSS) deposited by spin coating at 6000 rpm and were dried at room temperature, for one day under environmental conditions and silver (Ag) electrode was painting on the top of the device. Four types of active layers were used. Two types consisted in pure materials: PS and PMMA and the others two were mixture of PS: Buriti oil 47% and PMMA:Buriti oil 35%. All the mixtures were made with an appropriate quantity in the analytical reagent chloroform at room temperature. Such concentration was chosen based on previous studies [2]. In this way we obtained final devices with active area of 2 cm^2 whose structures are PEDOT: PSS/ Active layer /Ag.

The samples were subjected to direct irradiation solar light between 10:00 and 11:00 am by one minute. In this step, a convergent lens was used to concentrate the solar light on the samples. For such measures, we did not consider neither interference of the illumination nor the sample's angle of inclination. The open circuit voltage (V_{oc}) and the short-circuit current (I_{sc}) were measured using a common digital multimeter model ET-2042C Minipa. The table 1 shows these results. We observed that the values V_{oc} and I_{sc} of the samples with active layer using Buriti oil are more efficient than samples with pure PS or PMMA active layer. The junction effect characteristics were observed under laboratory illumination in room temperature with a Keithley 2400 programmable software semiconductor measuring system LabView. The voltage bias swept from -1.5 to 2 V. Figure 1 shows the IxV curve of PEDOT:PSS/Buriti oil 47%:PS/Ag and pure PS. Figure 2 shows the *I-V* curves of PEDOT:PSS/Buriti oil 35%:PMMA/Ag and pure PMMA.

The Buriti oil is a potential new material for use in solar cell and we believe that in few times a better result will be obtained.

Table 1: V_{oc} and I_{sc} measurements for the different solar cell illuminated under direct solar light.

Layer active	V_{OC} (mV)	I_{SC} (mA)
PS	1.0	0.01
PMAM	0.9	0.02
Buriti oil 47%: PS	1.9	0.03
Buriti oil 35%: PMAM	1.4	0.01

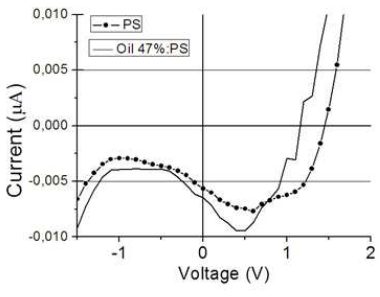

Figure 1: *I-V* curve of PEDOT:PSS/Buriti oil 47%:PS/Ag.

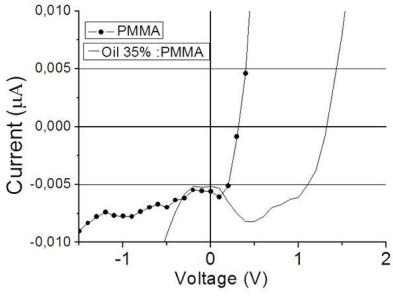

Figure 2: *I-V* curves of PEDOT:PSS/Buriti oil 35%:PMMA/Ag

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