Acta Scientific Applied Physics

Volume 2 Issue 2 February 2022

Editorial

Organic Semiconductors Based Electronic Devices - A Revolutionary Challenge in Semiconductor Aspect

Kushal Chakraborty*

Department of Physics, Jadavpur University, Kolkata, India

***Corresponding Author:** Kushal Chakraborty, Department of Physics, Jadavpur University, Kolkata, India.

Received: October 29, 2021

Published: January 01, 2022

Brief overview and outline

There are so many fields included in Physics to carry out investigation and gather profound knowledge over the hot debated stream of research. In this article, reflection has been given on Organic Semiconductor based electronics, a current emerging topic of Condensed Matter Physics having numerous applications in modern electronic devices.

Organic electronics, e.g. photovoltaics, displays, circuits, organic components and samples, offer lot of advantages over inorganic conventional semiconductor dye based electronics because of its flexibility, low cost, light weight, unbreakable property, excellent response timing etc. A significant growth of development of Organic Field Effect Transistor (OFET) has been encountered with wide range of utility. Organic diodes, OLEDs and OFETs are the fundamental building blocks used to the formation of organic electronics based circuits. Each display consists of huge number of transistors which are used for switching on/off the pixels of the device. One major interesting property of OFETs is that all forming layers of the device can be oriented and fabricated even at normal room temperature. An important aspect of the development of different electronic devices based on organic semiconducting elements is its power consumption ability in OLEDS comparatively than plasma displays and LCDs. Stage by stage precise increment of updatable attempt leads to the exploration of "quantum dot" elements.

One major breakthrough in this occasion is the production of Organic Photovoltaic devices (OPVs). Such devices are drawing increasing attentions as it is a proper alternative to resolve the problem of shortage of ingredients of natural energy resources and promotion of renewable energy. Though the devices are developing steadily, they are facing some fundamental limitations about their rapid growth of utilization. There are numerous factors which impact on current conduction into the device. Effect of traps is most significant factor in this regard. Since, organic materials are amorphous in nature with disordered structure and weak inter-atomic bonding; the materials are prone to traps. Traps are distributed inherently at the bulk regime of organic layers sandwiched between positive and negative electrodes. Injected carriers during conduction interact with distributed traps in this region. During such interaction process, injected charges depend on the trap density and trapping energy for a particular distribution. Injection of charges increases with slowly increasing applied bias voltage and initiation of trapping of carriers takes place gradually. In such a way, carriers struggle to conduct smoothly and hence device efficiency faces trouble to achieve satisfactory limit. Numerous attempts have been taken into account to resolve such trapping problem in organic devices. It has been reported earlier that incorporation of nano particles and different carbon nanotubes is a very suitable solution which improve the organic device efficiency. Nanotubes provide additional percolation path through which trapped carriers are percolated and conduction increases which leads to the fact of efficiency improvement. Impact of series resistance can also be controlled in this way.

The report will be fruitful for further physical understanding the underlying and practical implementation of OPVs. More investigation is required to achieve high efficiency of the device to use it as a

suitable and proper alternative of non renewable energy sources in our daily life and to find out other different electronic application of organic materials based devices furthermore in our daily life.

Acknowledgments

I would like to thank all authors and physicists who submitted their manuscripts to the first issue of the journal for publication. I am grateful to the respected reviewers who evaluate the relevance and novelty of the submitted manuscripts with their valuable suggestions for enrichment the quality of contributions. I thankfully acknowledge Ms. Sandhya, the Managing Editor, AS Applied Physics, who invited me as guest editor for this 1st issue. I am thankful also to all the staff of the Editorial Office who worked with their best to consistently maintain the whole peer-review processing schedule and timely managed publication.