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Photo-physics of organic semiconductors and a fundamental challenge for economic viability of organic solar cell technology

Lokendra Kumar
University of Allahabad, India

Organic semiconductors (OSCs) offer several potential advantages for the fabrication of low cost 'Plastic Electronics' such as Organic Light Emitting Diodes (OLEDs), Organic Photovoltaics (OPVs) and transistors. As Van der Waal's solids, OSCs form disordered films that results in a large number of defects with in the energy band gap (E_g) which lead the overall photo-physics and performance of devices. Single layer, bilayer and bulk heterojunction (BHJ) OPVs architectures have been studied extensively, but the mechanisms by which these processes improve the devices remain subjects of ongoing debate. Therefore, the understanding of photo-physics is still an important point and needs more discussion. This talk includes, the defect induced optoelectronic properties and exciton physics of organic semiconductors (OSCs) for OPVs. In addition to improved power conversion efficiency, OPVs also need to be sufficiently stable in order to be commercially viable. Ambient atmosphere dependent photovoltaic parameters of OPVs shall be discussed. Recently, we studied ZnPc/PTCDA bilayer devices and the role of nanostructuring of ZnPC surface on photovoltaic properties. It has been observed that nanostructured ZnPc surface in ZnPc/PTCDA bilayer devices shows a considerable improvement in short circuit current density (J_{sc}) and power conversion efficiency.

Biography

Lokendra Kumar has completed his PhD from C.C.S. University, Meerut, India and Postdoctoral studies from CSIR-National Physical Laboratory, New Delhi, India. He is the Assistant Professor of Physics, University of Allahabad (Govt. of India) where his work focuses on the physics of molecular materials and devices. Presently, he is working as a Raman fellow visiting scholar at the School of Electrical and Computer Engineering, Purdue University, USA on the stability issues of organic solar cell technology. He has published more than 40 papers in reputed journals and proceedings. He is serving as a reviewer of several journals.

lkumarau@gmail.com

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