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Performance investigation of ZnO / PVA nanocomposite film for organic solar cell

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Abstract

Organic solar cells are gaining popularity in the field of photovoltaics due to their solution processability, flexibility, low temperature fabrication, ease of integration, and environmental friendliness. Despite these characteristics, its energy conversion efficiency is still lower than other solar cells. It is therefore inevitable that the focus will be on improving the efficiency of organic solar cells. With this in mind, we have tried to improve its efficiency by developing and integrating ZnO / PVA nanocomposite film. The nano films were created using a solution casting method with varying concentrations of ZnO nanoparticles in a PVA

matrix. Each nanocomposite sample was tested individually with the organic solar cell. Significant changes are observed in the efficiency of organic solar cells before and after applying the ZnO / PVA nanocomposite film. The film with an optimum weight percentage of 14.25% (ZnO) and 85.75% (PVA matrix) shows significant efficiency enhancement when applied to organic solar cells having an architecture of [Carbon Fiber)/(ZnO /Epoxy Resin)/(CuO/Epoxy Resin)/Carbon Fiber]. The optimum efficiency of solar cell before and after applying the nanocomposite film was found to be 10.07% and 13.57% respectively. The increase in efficiency of organic solar cells showed that the ZnO / PVA nanocomposite film possesses significant potential to be applied on organic solar cells for its efficiency enhancement. The solution casting method has been discovered to be a cost-effective and hassle-free method for developing nanocomposite films. Low temperature processing and good conductivity of ZnO / PVA nanocomposite film makes it a suitable candidate for potential application in organic solar cells.

Author keywords

Efficiency enhancement; Organic solar cell; Photovoltaics; Solution casting method; ZnO / PVA nanocomposite

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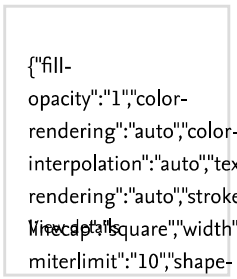

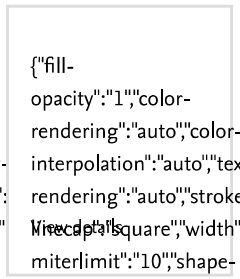

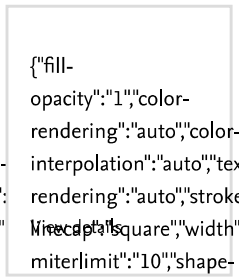

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