Important Strategy for Improving Stability of Perovskite for Fabricating High Efficiency Perovskite Thin Film Solar Cell Device

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***Abstract* - Metal halide perovskite is a promising material for next generation solar cell application due to their promising optical properties. Over the last few years, there are witnessed in high progress photo conversion efficiency (PCE). Till date, highest efficiency 25% is achieved. Here some potential strategy is giving in this present work like novel 2D MOF metal halide perovskite thin film is focused in this presented work. Moreover, two major challenged problems have found and analyzed. In this research work, 2D MOF, n-ZnO, p-CuO materials are used for retain stability, electron transport layer and hole transport layer respectively. Moreover, spray pyrolysis technique is used for making thin film fabrication. Therefore, we are used some potential strategies for fabricating wide area perovskite thin film, high stability and high photo conversion efficiency (PCE).Finally, future application is also discussed in the present work.**

Keywords: 2D-MOF, Perovskite, high stability, high efficiency, Spray Pyrolysis.

I. Introduction

The project is focused on fabricate metal halide Perovskite with 2D metal organic frame work for achieving high stability and efficiency for solar energy harvesting application. To date, Perovskite are one of the leading and peculiar candidates among the solar energy harvesting materials. Perovskite is a good player and sensational candidate in solar cell manufacturing industries. Moreover, Perovskite have promising potential strength such as wide range of band gap which can use absorb all spectrum and transfer its energy efficiently that it uses to make a highly efficient solar cell device. Besides, Perovskite are offering more and more advantages such as low cost and low temperature manufacturing process. The Perovskite materials can also be made cheaper and performed better than conventional device and manufacture at less than 200°C by solution and vapor deposition. So, very recently, Perovskite is strongly promoted to technologically for solar energy production. So far, the efficiency of Perovskite candidate rapidly increased from 3.8% to 25%.The pivot points of Perovskite is encouraged to make a highly power conversion efficiency solar cell. However, there are some challenging problems therefore the problems such as in stability, large area with high uniformity are not yet to be overcome. To eliminate these problems, to retain material stability, we have to use some potential strategies means that new kind of materials such as 2D metal organic framework (2D-MOF) will use as the protection layer on Perovskite layer for no loss efficiency. Therefore, metal halide Perovskite ABX_3 (A=Metal perovskite, B= Pb, X=I, Cl, Br), p-CuO (HTL), n-ZnO (ETL) and FTO, ITO will use as materials and substrates to fabricate 2D MOF metal halide Perovskite thin film.Therefore, let us considered a 2D metal organic framework (2D-MOF) on Perovskite layer to achieve stability to retain stability and efficiency. So, the new construction approach will be a blueprint for solar cell applications. Therefore, the research direction is 1.Material construction to improve stability with high efficiency, 2.Spray pyrolysis, 3.Stability Analysis, 4.Efficiency Measurement, 5.Device Fabricate. This research ideas work will demonstrate stability and efficiency of Perovskite.

II. METHODOLOGY

Material and Coating Technique

This work focused on fabrication of 2D metal organic framework (MOF) metal halide Perovskite thin film for solar cell application. Simple spray pyrolysis can use to fabricate Perovskite thin film. Moreover, spray pyrolysis is an undoubtedly desirable and gifted technique to control the growth properties of the layers. Spray pyrolysis deposition offers more advantages to scalable fabrication, low cost in fabrication and uniform deposition over large areas. Therefore, undoubtedly, spray pyrolysis deposition will be potential technique to develop scalable device. In spray coating technique, Perovskite shows different photo conversion efficiency (PCE) according to substrate active area, example is 13.9 % (PCE) for 1 cm^2 (active area), 11.7% (PCE) for 3.8 cm^2, 15.5%for 5 cm^2 and remarkably 17.6%,18.26% and 19.19% for 1 cm^2. At research level, they attempt only preliminary level to reveal the photo conversion efficiency (PCE) based on the active area size or substrate size. Therefore, in this work, large active area thin film solar cell will fabricate by spray pyrolysis deposition. In this work, concentration of solutions will concentrate to fabricate uniform large area scalable Perovskite device with high stability. Therefore, 2D metal organic framework metal halide Perovskite thin film will fabricate based on given optimization parameters.FTO, Glass will use as substrate, Perovskite solution concentration and viscosity, Substrate temperature ,Nozzle diameter, Spray flow rate. Materials formula is ABX3 (A=Formamidinium (FA) , A= CH_3NH_3, B= $Pb2^+$, X=I, Cl, Br), 2D MOF (metal organic framework) and n-ZnO and p-CuO will use to fabricate scalable device.

III. Device fabrication

To fabricate scalable device, viscosity, solution concentration, floe rate and substrate temperature will strongly be promising factors for fabricating high quality 2D MOF perovskite thin film for solar cell application. Majorly, the parameters will be used to morphology and film uniform control that lead to fabricate high quality perovskite active layer, electron and hole transport layer. Therefore, spray pyrolysis technique is considering carefully for fabricating scalable perovskite thin film for solar cell application. Our major objective is to fabricate 2D MOF metal halide perovskite thin film for achieving high stability and photoconversion efficiency (PCE). Here, schematic illustration of 2D MOF metal halide perovskite thin film solar cell device in fig 1.

Fig.1.Schematic diagram of 2D-MOF Perovskite thin film.

The major strategy is, material construction is main one to achieve high stability and high efficiency Perovskite thin film device. To achieve high stability such potential materials are introduced here namely metal halide perovskite, 2D-MOF.Because,2D MOF helps to retain stability. Bearing these aims in mind, we turn our care to 2D MOF layer on metal halide perovskite for achieving high stability with no loss efficiency. There is no doubt that the new entrant material construction will offer prospects of captivation. Hence, due to these the present strategies, stability and efficiency can be improved.

IV. Conclusion

For future energy compromise, some important strategies which mean that potential candidates are introduced namely 2 dimension- metal organic frameworks (2D MOF) for achieving high stability Perovskite for solar energy harvesting device fabrication. The 2D MOF metal halide Perovskite device will play a remarkable role in material stability. The performance of this fabricate Perovskite

will be a new mile stone in energy production. Therefore, the some main expected results are demonstrate positive contribution stability and energy efficiency, Identification suitable way to achieve stability and efficiency, Capture more light, Improve efficiency, stability at all levels, High efficiency than conventional, High stability than conventional, Working long time, working at moisture and other environmental conditions with no loss in stability and efficiency, Minimum degradation. Hence, the given strategy and potential candidates will be playing a important roll on Perovskite thin film solar cell device fabrication.

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