# INVESTIGATING THE EFFECT OF SILVER OXIDE LAYER(AgOx) ON THE ELCTRICAL AND OPTICAL PROPERTIES OF PERVOSKITE-BASED STRUCTURE/DEVICE

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## ABSTRACT

- In recent years perovskite solar cells (PVSCs) have emerged as highly promising solar advancements due to their highly cost-effective manufacturing processes and excellent performance
- Commercialization is hampered by instability and decreasing efficiency due to photo-degradation.
- This work focuses on investigating how the addition of silver oxide layer in the device affects the optical and electrical properties of the perovskite structure.
- The team fabricates a device using a glass/ITO(indium-doped tin oxide)/AgOx/PEDOT:PSS/MAPbI3/PCBM/Ag device configuration.
- It was found that incorporating the silver Oxide layer is a good option for devices in stability and performance. The device obtained an increase in power efficiency by 28%.

Reference:1

## INTRODUCTION

- Perovskite solar cells have made lots of progress since its inception. Although it as great advantages including low production cost and easy fabrication process compared to traditional silicon based solar cells, mass production is still a great issue.
- Several research reports have emerged confirming that prolonged sunlight exposure reduces performance of the device. Studies by Ito et al. proofed that degradation can be caused by a variety of factors, including degradation of the PVSC itself.
- Other reasons for poor performance/ instability has been reported to be as a result degradation at the electrode and active region interface or charge transport layers (CTLs)
- In this work AgOx layer is added between PEDOT:PSS and ITO layer and the device is fabricated with ITO as the electrode, PEDOT:PSS as the hole transport layer, PCBM as the electron transport layer, Ag as the counter electrode with methyl ammonium lead iodide as the active layer.

References: 2,3,4

## RESEARCH METHOD

The fabrication of the device consist of six layers. Figure 1 shows the proposed perovskite device structure .

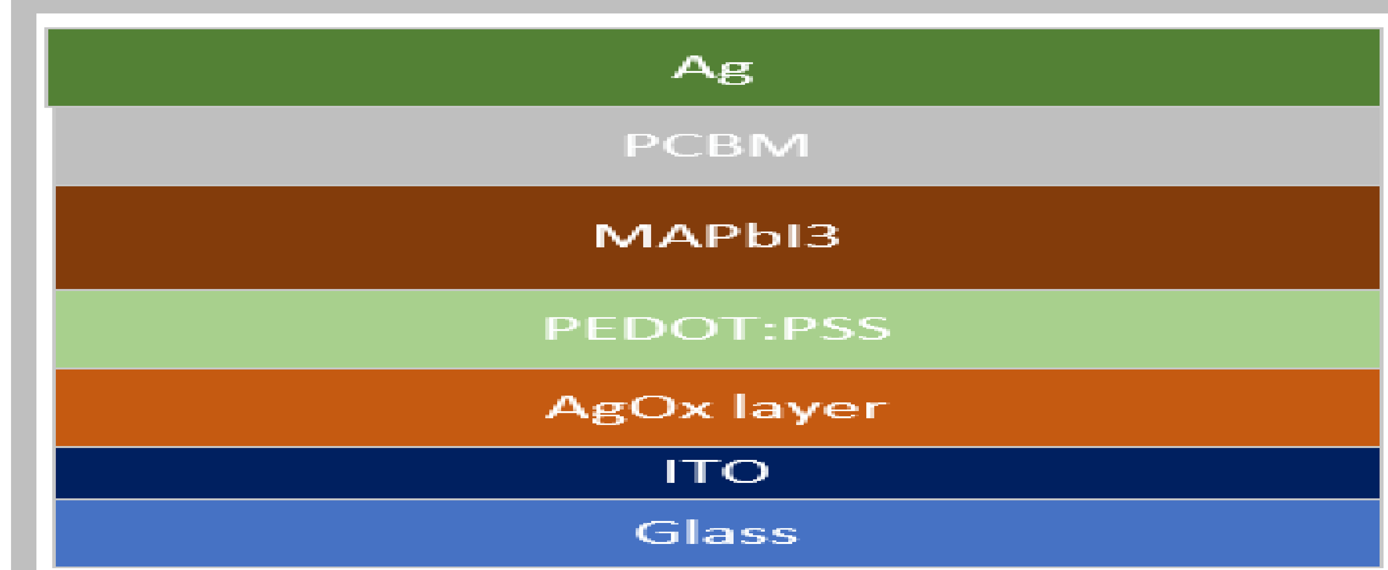


Figure 1: Image showing layers of the perovskite device.

Glass substrates with patterned ITO are washed in ultrasonic baths of water, acetone and isopropyl followed by 15 mins ozone treatment.1nm of Ag was deposited by thermal evaporation on the ITO surface followed by 1 min ultraviolet ozone treatment. PCBM was dissolved in 1, 2-dichlorobenzene and PEDOT:PSS solution was spin coated at 5000 rpm for 60s. Subsequently, Pb (OAc)2:MAI solutions were spin-coated on PEDOT for 60 seconds at 4x 103 rpm and annealed afterwards. After that PCBM layers were spin-coated on the perovskite layer at 600 rpm for 1 min and annealed at 120˚C on a hot plate for 30 mins. Finally, Ag was deposited by thermal evaporation unto the surface of the layers.

Reference: 1,5

## RESULTS

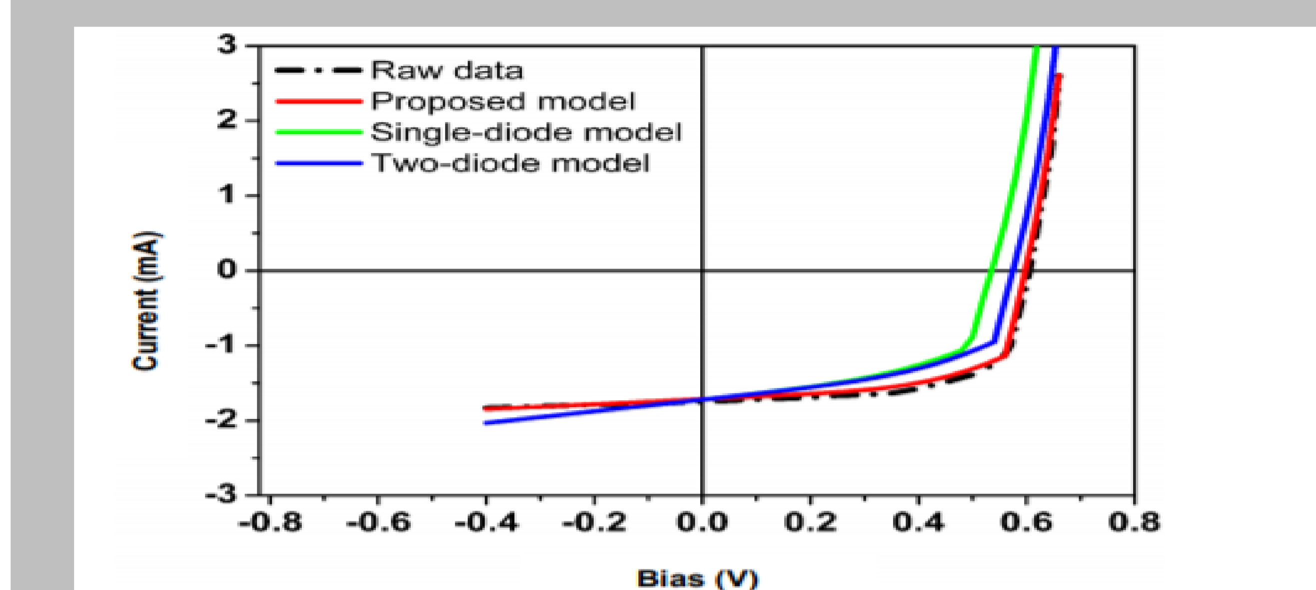


Figure 2: I-V plots for experimental data and simulated plots for proposed model, single and two diode model under illumination intensity of 100mW/cm2.

- No conclusive results on this research yet but similar approach was used by Hossain et al. to study the addition of AgOx layer on organic solar cells and proposed ana equivalent circuit model for the device.
- Simulation curves and I-V plots the proposed model correlated with experimental results.
- Average percentage variation observed was 2.3% and addition of AgOx layer resulted in 28% increase in power Conversion efficiency.

Reference: 5

## CONCLUSION

- The device with added AgOx interfacial layer showed PCE increase by 28% and 33% increase of fill factor form earlier research as discussed.
- Studies in this field opens opportunities to making more carbon reducing energy technologies that have great performance.
- Breakthrough in this research will also lead to mass production of perovskites devices for applications in photovoltaics, solar cells, optical devices and many more.

## REFERENCES

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