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**Marjoni Imamora <marjoniimamora@gmail.com>**

# Submission Confirmation from Materials Letters

2 messages

**Materials Letters** <eesserver@eesmail.elsevier.com> Sun, May 3, 2020 at 1:33 PM
Reply-To: Materials Letters <matlet@elsevier.com>
To: nurjoniimamora@yahoo.com, Marjoniimamora@gmail.com

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Dear Dr. Ali Umar,

Your submission entitled "The Influence of Molybdenum Diselenide (MoSe2) Coated on Pt Film to DSSC Performance with the Structure TiO2/Dye/LxMoSe2Pt (with x=0-5)" belonging to VSI:ML/AI at Mat Sci has been received by Materials Letters.

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# Please edit your submission

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**Materials Letters** <eesserver@eesmail.elsevier.com> Mon, May 4, 2020 at 8:35 PM
Reply-To: Materials Letters <matlet@elsevier.com>
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Re:
Title: The Influence of Molybdenum Diselenide ($MoSe_2$) Coated on Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/$L_xMoSe_2Pt$ (with x=0-5)

Dear Dr. Ali Umar,

Your submission entitled "The Influence of Molybdenum Diselenide ($MoSe_2$) Coated on Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/$L_xMoSe_2Pt$ (with x=0-5)" has been received by Materials Letters or its open access mirror.

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**Marjoni Imamora <marjoniimamora@gmail.com>**

# A manuscript number has been assigned - MLBLUE-D-20-01935

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Dear Dr. Ali Umar,

Your submission entitled "The Influence of Molybdenum Diselenide (MoSe2) Coated on Pt Film to DSSC Performance with the Structure TiO2/Dye/LxMoSe2Pt (with x=0-5)" has been been assigned the following manuscript number: MLBLUE-D-20-01935.

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Re: MLBLUE-D-20-01935
Title: The Influence of Molybdenum Diselenide (MoSe2) Coated on Pt Film to DSSC Performance with the Structure TiO2/Dye/LxMoSe2Pt (with x=0-5)

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Title: The Influence of MoSe2 Coated onto Pt Film to DSSC Performance with the Structure TiO2/Dye/LxMoSe2Pt (0≤x≤5)
Authors: Marjoni Imamora Ali Umar, Ph.D; Resti R; Akrajas Ali Umar

Dear Marjoni Imamora Ali Umar,

The PDF for your submission, "The Influence of MoSe2 Coated onto Pt Film to DSSC Performance with the Structure TiO2/Dye/LxMoSe2Pt (0≤x≤5)" has now been built and is ready for your approval. Please view the submission before approving it, to be certain that it is free of any errors. If you have already approved the PDF of your submission, this e-mail can be ignored.

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Dear Dr. Ali Umar,

The reviewer(s) and editor have evaluated your manuscript "The Influence of MoSe2 Coated onto Pt Film to DSSC Performance with the Structure TiO2/Dye/LxMoSe2Pt (0≤x≤5)" (Dr. Marjoni Imamora Ali Umar). As you will see from the comments below and on https://ees.elsevier.com/mlblue/, moderate revision has been requested. Given that the requested revisions are moderate the new version is required within Jun 16, 2020.

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Editor

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COMMENTS FROM EDITORS AND REVIEWERS

Reviewer #1: Umar et al. reported the influence of Molybdenum Diselenide (MoSe2) coating on platinum (Pt) for the performance of dye-sensitized solar cells (DSSCs). The champion DSSC devices with  iO2/Dye/L2MoSe2Pt structures led to a current-density of 11,204 mA/cm2, Voc of 0.660 mV, and solar cell efficiency of 2,967%, respectively. The results are ok. The paper can be accepted for publication if the authors can fully address the following comments.
There are grammar errors or typos in the manuscript. For example, 0.660 mV should be 0.66V for Voc. The write-up of "…have resulted in current-density, Voc, and solar cell performance of 11,204 mA/cm2, 0.660 mV, and 2,967%, respectively…" should be corrected to "…a current-density of 11,204 mA/cm2, Voc of 0.660 mV, and solar cell efficiency of 2.967%,…". The device efficiency should be 2.967%, not 2,967%.... The authors should ask a native English speaker to fully check the paper to correct all such errors.
The device efficiency of 2.967% is pretty low. A regular Pt counter electrode DSSC should be fabricated as reference cell to find out the cause for low efficiencies.
Look like more data should be added to the manuscript.
There are many counter electrode literature papers that should be cited/discussed in the revised paper. These include RSC advances 6 (14), 11481-11487, 2016; Nanoscale 5 (23), 11742-11747, 2013; Nano Energy 11, 550-556, 2015; ChemSusChem 8 (5), 817-820, 2015; Thin Solid Films 562, 578-584, 2014; Nano Energy 4, 157-175, 2014; Nanoscale 4 (15), 4726-4730, 2012; Journal of Materials Chemistry A 2 (29), 11448-11453, 2014; Nano Energy 22, 558-563, 2016; Nano Energy 5, 116-121, 2014; Chemistry-A European Journal 21 (43), 15153-15157, 2015; Journal of Applied Physics 119 (13), 135501, 2016; Journal of Materials Chemistry A 3 (40), 20359-20365, 2015.

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To: nurjoniimamora@yahoo.com, Marjoniimamora@gmail.com

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Manuscript Draft

Manuscript Number: MLBLUE-D-20-01935R1

Title: The Influence of $MoSe_2$ Coated onto Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/LxMoSe2Pt ($0 \leq x \leq 5$)

Article Type: Short Communication

Keywords: Counter-electrode, semiconductors, LxMoSe2Pt, $MoSe_2$, DSSC-performance

Corresponding Author: Dr. Marjoni Imamora Ali Umar, Ph.D

Corresponding Author's Institution: Institut Agama Islam Negeri (IAIN) Batusangkar

First Author: Marjoni Imamora Ali Umar, Ph.D

Order of Authors: Marjoni Imamora Ali Umar, Ph.D; Resti R; Venny Haris; Akrajas Ali Umar

Abstract: Research on the influence of Molybdenum Diselenide ($MoSe_2$) coating on platinum (Pt) to performing dye-sensitized solar cell (DSSC) with the structure of $TiO_2$/Dye/LxMoSe2Pt, ($0 \leq x \leq 5$) is reported. The hydrothermal method has successfully synthesized the $TiO_2$ film with square and porous morphology on the indium titanium oxide (ITO) surface. Four peaks of the Raman Scattering detected from the semiconductor confirm the formation of $TiO_2$ film. The liquid-phase deposition (LPD) also successfully prepared the Pt film. Onto the prepared Pt, the $MoSe_2$ was coated to produce LxMoSe2Pt ($0 \leq x \leq 5$) and then use them as the counter electrode (CE). The best DSSC devices with $TiO_2$/Dye/L2MoSe2Pt structures have resulted in current-density, Voc, and solar cell performance of 11.204 mA/cm2, 0.66 V, and 2.967%, respectively. The Bode graph confirmed this device has the longest lifetime, proven by the highest peak rise in the lowest frequency. Besides, high-frequency also shows the device has low resistance, useful for accelerating the electrons flow and enhancing DSSC performance.

17 May 2020

Dear Editor,

SUBMISSION OF A REVISED MANUSCRIPT FOR EVALUATION

Thank you for the opportunity to revise our manuscript. We would like to submit the revised version of our manuscript entitled "The Influence of $MoSe_2$ Coated onto Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/Lx$MoSe_2$Pt (0≤x≤5)" (REF: # MLBLUE-D-20-01935) to the Materials Letters

We have considered for almost of comment and suggestion of the reviewer and give a few arguments for certain comments and suggestions of the reviewer. We agreed with the comments and corrections of reviewer. We thank the Editor and the reviewer for their detailed and thoughtful critiques. Below we summarize our point-by-point responses to the reviewer's comments. We believe that all of the comments have been addressed in a way that the reviewer would find satisfactory.

Reviewer#1:

1. There are grammar errors or typos in the manuscript. For example, 0.660 mV should be 0.66V for Voc. The write-up of "…have resulted in current-density, Voc, and solar cell performance of 11,204 mA/cm2, 0.660 mV, and 2,967%, respectively…" should be corrected to "…a current-density of 11,204 mA/cm2, Voc of 0.660 mV, and solar cell efficiency of 2.967%,…". The device efficiency should be 2.967%, not 2,967%.... The authors should ask a native English speaker to fully check the paper to correct all such errors.

   The Typos and grammar errors has been corrected in the revised paper.

2. The device efficiency of 2.967% is pretty low. A regular Pt counter electrode DSSC should be fabricated as reference cell to find out the cause for low efficiencies. Look like more data should be added to the manuscript.

   The reasons has been added in the revised paper

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* Chemistry-A European Journal 21 (43), 15153-15157, 2015

* Journal of Applied Physics 119 (13), 135501, 2016

* Journal of Materials Chemistry A 3 (40), 20359-20365, 2015.

The above papers have been referenced in the revised paper.

Thank you very much for your co-operation.

Sincerely,

Dr. Marjoni Imamora Ali Umar

Department of Physics Education
Faculty of Tarbiyah and Teacher Training
Institut Agama Islam Negeri (IAIN) Batusangkar
27213, Lima Kaum, Batusangkar, West Sumatera
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E-mail: Marjoniimamora@gmail.com and nurjoniimamora@yahoo.com

***Mark Manuscript**

# The Influence of $MoSe_2$ Coated onto Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/$L_xMoSe_2Pt$ ($0 \leq x \leq 5$)

**Marjoni Imamora Ali Umar[1*], Resti[1], Venny Haris[1], Akrajas Ali Umar[2]**

[1]Department of Physics Education, FTIK, IAIN Batusangkar, 27213, Batusangkar, Tanah Datar, West-Sumatera, Indonesia

[2] IMEN, Universiti Kebangsaan Malaysia, Bangi, Selangor Darul Ehsan, Malaysia

*Email: nurjoniimamora@yahoo.com; marjoni.imamora@iainbatusangkar.ac.id

## Abstract

Research on the influence of Molybdenum Diselenide ($MoSe_2$) coating on platinum (Pt) to performing dye-sensitized solar cell (DSSC) with the structure of $TiO_2$/Dye/$L_xMoSe_2Pt$, ($0 \leq x \leq 5$) is reported. The hydrothermal method has successfully synthesized the $TiO_2$ film with square and porous morphology on the indium titanium oxide (ITO) surface. Four peaks of the Raman Scattering detected from the semiconductor confirm the formation of $TiO_2$ film. The liquid-phase deposition (LPD) also successfully prepared the Pt film. Onto the prepared Pt, the $MoSe_2$ was coated to produce $L_xMoSe_2Pt$ ($0 \leq x \leq 5$) and then use them as the counter electrode (CE). The best DSSC devices with $TiO_2$/Dye/$L_2MoSe_2Pt$ structures have resulted in current-density, Voc, and solar cell performance of 11.204 mA/cm$^2$, 0.66 V, and 2.967%, respectively. The Bode graph confirmed this device has the longest lifetime, proven by the highest peak rise in the lowest frequency. Besides, high-frequency also shows the device has low resistance, useful for accelerating the electrons flow and enhancing DSSC performance.

**Keywords:** Counter-electrode, semiconductors, $L_xMoSe_2Pt$, $MoSe_2$, DSSC-performance

## Introduction

DSSC is a solar device with semiconductor-based which determined by the effectiveness of the photo-physiochemical phenomenon on the semiconductor [1]. As a third-generation solar-cell has several advantages, such as cheaper, simple-production, and high-efficiency [2]. We believe the efficiency might be enhanced by modifying the key components of the DSSC, such as semiconductor, CE, and electrolyte. Semiconductors which have wide band-gap energy such as $TiO_2$ [3] with the sense of dye-sensitized material, and the CE with high electro-catalytic, good conductivity and stable [2] could further improve the DSSC performance.

Pt is a popular CE in DSSC application due to it has high efficiency [4, 5] compared to Carbon and Graphene [6-18]. However, an effort to further enhance the Pt properties by adding or attach them to other materials has been reported . For instance, Graphene (G-Pt) and reduced graphene oxide/rGO (rGO-Pt), resulting in the efficiency increased around 0.8% and 0.9%, respectively [19]. Besides, Gong et al. added one-layer of Pt on Graphene (GNS) [6], resulting in the efficiency increased from 4.76% (Pt) to 6.09% (GNS/Pt). Besides, Cheng et al. also reported the $MoS_2$ addition (Pt/$MoS_2$) producing the device performance increase of 0.6% [20]. In this research, we report the use of $MoSe_2$ as a coated layer on platinum and then used them as a CE on the DSSC device. Since it has a very active electrocatalytic, good conductivity [21] and resistant to corrosion caused by electrolytes [22]. The best performance obtained is 2.967% with the $V_{OC}$ and fill-factor generated by 0.66 V and 40.11%, respectively.

## Material and Methods

*Synthesis $TiO_2$ and Pt + $MoSe_2$ ($L_xMoSe_2Pt$, $0 \leq x \leq 5$)*

We purchased all chemicals in this work from Sigma-Aldrich. We synthesized $TiO_2$ semiconductor on the ITO substrate by using a growth solution which consists of 5 mL Ammonium-Hexafluorotitanate and 5 mL boric acid with deionized (DI) water. The detail of the synthesis process has been well-explained in the previous report [3]. Pt films were synthesized using the LPD method on the ITO substrate. We started the Pt synthesis from seeding 3 times by using a solution of L-Ascorbic Acid and potassium tetrachloroplatinate ($K_2PtCl_4$) with a temperature of 50°C for 2 hours. After that, we continued to Pt growth, using a solution of $K_2PtCl_4$, L-Ascorbic Acid, Polyvinyl pyrrolidone, and natrium hydroxide with a temperature of 50°C for 5 hours. Last, the prepared Pt was then annealed in an oven for 1 hour at 250°C. Next, the resultant Pt was coated by $MoSe_2$, forming the $L_xMoSe_2Pt$ ($0 \leq x \leq 5$) film using the LPD method. The Pt film was put into the growth-solution (0.5 M of Hexamethylenetetramine 0.5 M, 0.05 M of Ammonium Tetrathromolybdate, 0.1 M of Sodium Borohydrate and 0.01 M of Selenium) and synthesized using water-bath at 90°C for 30 minutes. We repeated these steps to produce two until five layers of $MoSe_2$. Last, the coated Pt was annealed by hydrogen flow at 300˚C for 3 hours. During the synthesis process, the morphology of $TiO_2$ and Platinum film was observed with a FESEM and Raman Scattering as well.

*Preparation of DSSC Devices with the structured of $TiO_2$/Dye/$L_xMoSe_2Pt$ ($0 \leq x \leq 5$)*

We designed DSSC devices as Fig. 2B to see the influence of $L_xMoSe_2Pt$ ($0 \leq x \leq 5$) film as a CE on the device performance. The $TiO_2$ semiconductor as a photoanode is assembled (after immersed in dye solution (0.05 mM N719) at room temperature for 15 hours) with a CE using a metal clamp. A para-film with a circle hole of 0.23 $cm^2$ was sandwiched between the $TiO_2$ and the $L_xMoSe_2Pt$ and injected the electrolyte solution. Last, the current-voltage (J-V) curve of the DSSC was obtained using the Gamry instrument under illumination by simulated sunlight with an intensity of 100 mW $cm^2$ to characterize the device performance.

## Results and Discussion

FESEM image shows the synthesized $TiO_2$ successfully covered the entire ITO surface (see Fig. 1A). The $TiO_2$ particles have a morphology that resembles a square shape (Fig. 1B, 1.C) with porous structures and varying particle sizes (see Fig.1C and 1D). The porous structure is believed caused by the use of high temperatures during the growth process. This condition is useful to absorb more dye and enhanced DSSC performance [3]. Fig. 1E shows the Raman Scattering spectrum consisting of 4 peaks of 141 $cm^{-1}$, 393 $cm^{-1}$, 513 $cm^{-1,}$ and 636 $cm^{-1}$ with one peak having high intensity between 100-800 $cm^{-1}$. The resultant peaks are comparable with the research results of Tian et al. [23] and confirm the formation of $TiO_2$.

Fig. 2A is the FESEM image of Pt with asymmetrical structures (particle size of 156 ± 16 nm) and covers the entire ITO surface. Next, the synthesized $L_xMoSe_2Pt$ ($0 \leq x \leq 5$) was used as CE in DSSC devices with the structured $TiO_2$/Dye/$L_xMoSe_2Pt$ (see Fig 2B). The J-V curve of DSSC and the photovoltaic parameter are described in Fig. 2C and Table 1, respectively. From the Table 1 shows the DSSC performance start from 2.858%, and then decreased to 2.364% when using $L_1MoSe_2Pt$ as CE. We believed, it occurred as an effect of the heating repetition during $MoSe_2$ coating, and causing the Pt structure damaged and reduced film adhesion [24]. Interestingly, the DSSC performance increase when using the $L_2$MoSe2Pt as CE to 2.967%. In this stage the $MoSe_2$ coating rather thick, and covering the Pt structure from directly exposed to high temperature, improving the surface area and their conductivity [6]. Besides, the increasing of the surface area providing sensitization of dye materials, speed-up the electrolyte redox reaction [25], and producing higher performance [26]. Then, the DSSC performance decrease again with the number of $MoSe_2$ coating layer increased ($L_3MoSe_2Pt$, $L_4MoSe_2Pt$, and $L_5MoSe_2Pt$). Besides the previous reason, since the addition of each layer of $MoSe_2$ does not followed by the annealed process, causing the bond between them still fragile and easily damaged also causing this phenomenon. The best DSSC performance shows 0.11% higher than the first devices and confirming the coated of $MoSe_2$ are successfully catalyst the Pt film [2, 27]. Since the $TiO_2$, dye-materials [16, 18], and electrolyte-selection are far from being optimized, applying the Pt in optimized device will enhanced the DSSC performance.These results also support by Bode graphs (see Fig. 3) which shows that this device produces the highest peak on the lowest frequency. Its means, high-frequency peaks show the device has small resistance and highest lifetime compared to other [28]. Besides, the small resistance leading to speed-up the flow of electrons [25], and producing the DSSC devices with the higher performance [29].

## Conclusion

The influence of $MoSe_2$ coated onto Pt film to produce $L_xMoSe_2Pt$ ($0 \leq x \leq 5$) as CE on the DSSC performance has been carried out. The best DSSC devices with the structure of $TiO_2$/Dye/$L_2MoSe_2Pt$ have resulted in current density, Voc, and solar cell performance of 11.204 $mA/cm^2$, 0.66 V, and 2.967%, respectively. Bode graph confirming the device structure has the highest lifetime because of the highest peak is detected on the lowest frequency. Besides, the high-frequency peaks also show small device resistance, leading to accelerating the electrons flow and enhanced DSSC performance.


## Acknowledgment:

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Figure Captions

Fig. 1. **A-D)** are the FESEM image of a $TiO_2$ semiconductor film, and **E)** The Raman Scatering Spectra of $TiO_2$

Fig. 2. **A)**. The FESEM image of Pt film (magnification of 50,000 times), **B)**. DSSC array with the $MoSe_2$ coating. **C)**. The J-V curve of DSSC devices with the structure $TiO_2$/Dye/$L_xMoSe_2$Pt ($0 \leq x \leq 5$).

Table 1 The photovoltaic parameters of DSSC device with the structure $TiO_2$/Dye/$L_xMoSe_2$Pt ($0 \leq x \leq 5$)

Fig. 3 Bode graphics of 6 DSSC devices with structure $TiO_2$/Dye/$L_xMoSe_2$Pt ($0 \leq x \leq 5$)

Highlights

- The LPD has been successfully synthesized the asymmetrical Pt onto ITO substrate
- The DSSC performance increase with the number of $MoSe_2$ coated to Pt film increased
- The DSSC with $TiO_2$/Dye/$L_2MoSe_2Pt$ have resulted in the best performance of 2.967%
- The $MoSe_2$ coated are successful catalyst to the Pt film
- The Bode graph shows the $TiO_2$/Dye/$L_2MoSe_2Pt$ show small device resistance

*Revised Manuscript

# The Influence of $MoSe_2$ Coated onto Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/$L_xMoSe_2Pt$ ($0 \leq x \leq 5$)

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## Abstract

Research on the influence of Molybdenum Diselenide ($MoSe_2$) coating on platinum (Pt) to performing dye-sensitized solar cell (DSSC) with the structure of $TiO_2$/Dye/$L_xMoSe_2Pt$, ($0 \leq x \leq 5$) is reported. The hydrothermal method has successfully synthesized the $TiO_2$ film with square and porous morphology on the indium titanium oxide (ITO) surface. Four peaks of the Raman Scattering detected from the semiconductor confirm the formation of $TiO_2$ film. The liquid-phase deposition (LPD) also successfully prepared the Pt film. Onto the prepared Pt, the $MoSe_2$ was coated to produce $L_xMoSe_2Pt$ ($0 \leq x \leq 5$) and then use them as the counter electrode (CE). The best DSSC devices with $TiO_2$/Dye/$L_2MoSe_2Pt$ structures have resulted in current-density, Voc, and solar cell performance of 11.204 mA/cm$^2$, 0.66 V, and 2.967%, respectively. The Bode graph confirmed this device has the longest lifetime, proven by the highest peak rise in the lowest frequency. Besides, high-frequency also shows the device has low resistance, useful for accelerating the electrons flow and enhancing DSSC performance.

**Keywords:** Counter-electrode, semiconductors, $L_xMoSe_2Pt$, $MoSe_2$, DSSC-performance

## Introduction

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## Results and Discussion

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Figure Captions

Fig. 1. **A-D)** are the FESEM image of a $TiO_2$ semiconductor film, and **E)** The Raman Scatering Spectra of $TiO_2$

Fig. 2. **A)**. The FESEM image of Pt film (magnification of 50,000 times), **B)**. DSSC array with the $MoSe_2$ coating. **C)**. The J-V curve of DSSC devices with the structure $TiO_2$/Dye/$L_xMoSe_2$Pt ($0 \leq x \leq 5$).

Table 1 The photovoltaic parameters of DSSC device with the structure $TiO_2$/Dye/$L_xMoSe_2$Pt ($0 \leq x \leq 5$)

Fig. 3 Bode graphics of 6 DSSC devices with structure $TiO_2$/Dye/$L_xMoSe_2$Pt ($0 \leq x \leq 5$)

# Figure and Table

## The Influence of $MoSe_2$ Coated onto Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/$L_xMoSe_2Pt$ ($0 \leq x \leq 5$)

**Marjoni Imamora Ali Umar[1*], Resti[1], Venny Haris[1], Akrajas Ali Umar[2]**

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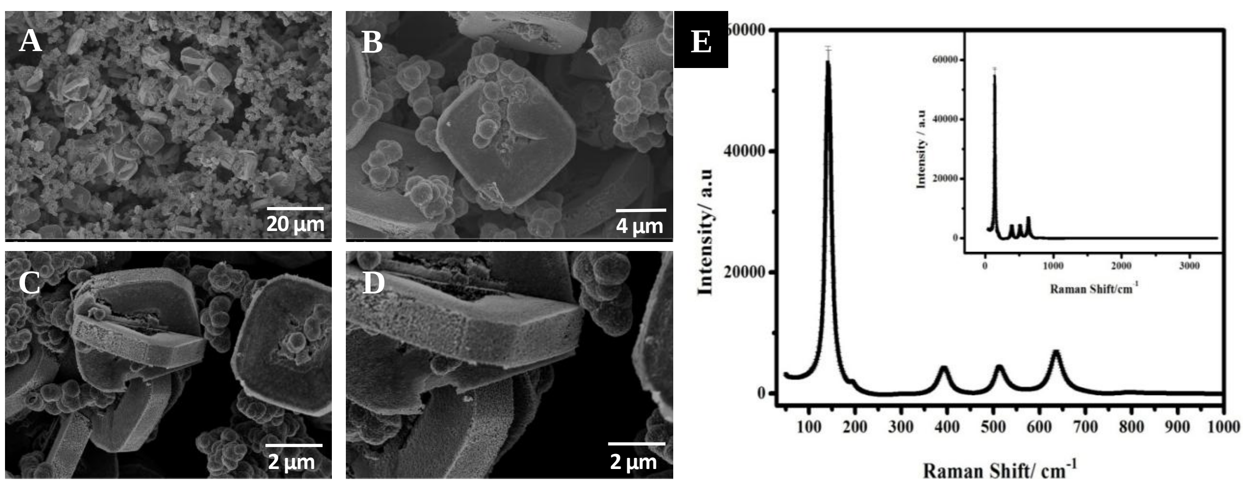



Fig. 1

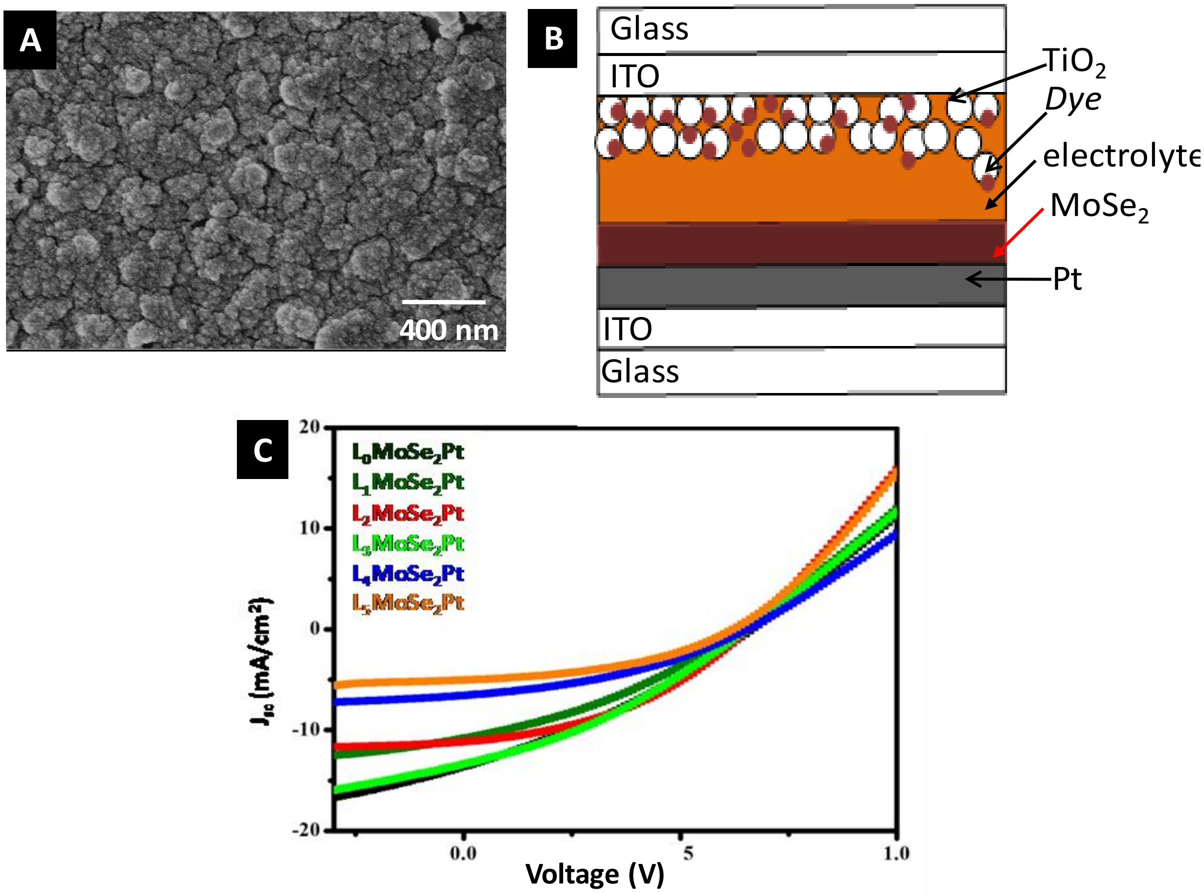
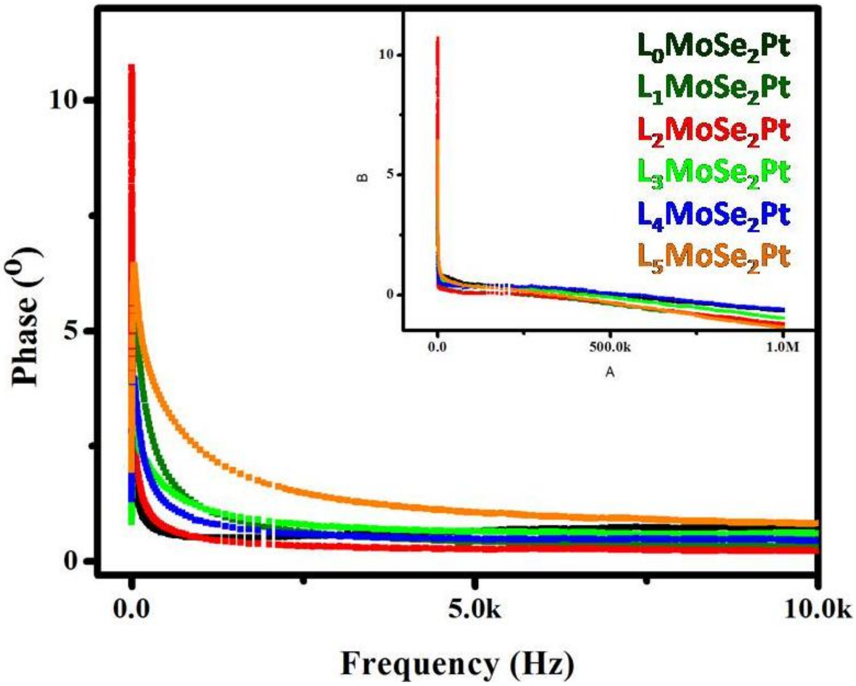

A
400 nm
B
Glass
ITO
TiO2
Dye
electrolyte
MoSe2
Pt
ITO
Glass
C
L0MoSe2Pt
L1MoSe2Pt
L2MoSe2Pt
L3MoSe2Pt
L4MoSe2Pt
L5MoSe2Pt
20
10
0
-10
-20
Jsc (mA/cm2)
0.0
5
1.0
Voltage (V)

Fig. 2

Tabel 1

| CE | Voc (V) | Jsc (mA/cm$^2$) | FF(%) | Eff (%) |
|---|---|---|---|---|
| $L_0MoSe_2Pt$ | 0.67 | 13.635 | 31.26 | 2.858 |
| $L_1MoSe_2Pt$ | 0.65 | 10.861 | 33.47 | 2.364 |
| $L_2$MoSe2Pt | 0.66 | 11.204 | 40.11 | 2.967 |
| $L_3MoSe_2Pt$ | 0.66 | 13.426 | 32.92 | 2.921 |
| $L_4MoSe_2Pt$ | 0.66 | 6.600 | 37.67 | 1.644 |
| $L_5MoSe_2Pt$ | 0.63 | 5.078 | 42.13 | 1.350 |



Phase ($^0$)
Frequency (Hz)
10
5
0
0.0
5.0k
10.0k
$L_0MoSe_2Pt$
$L_1MoSe_2Pt$
$L_2MoSe_2Pt$
$L_3MoSe_2Pt$
$L_4MoSe_2Pt$
$L_5MoSe_2Pt$
B
A
500.0k
1.0M


Fig 3

*Credit Author Statement

# Credit Author Statement

**The Influence of $MoSe_2$ Coated onto Pt Film to DSSC Performance with the Structure $TiO_2$/Dye/$L_xMoSe_2Pt$ ($0 \leq x \leq 5$)**

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**Marjoni Imamora Ali Umar:** Data Analysis, Conceptualization, Methodology, Writing- Original draft preparation, Reviewing and Editing.

**Resti.**: Investigation, Data Collection, Writing- draft preparation.

**Venny Haris**: Investigation and Validation.

**Akrajas Ali Umar***:* Supervision, Conceptualization, Methodology Reviewing and Editing**.**

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**Declaration of interests**

☑The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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