ANNEXURE - VIII

ज्ञान-विज्ञान विमुक्तये

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

Executive Summary of the Work Done on the Major Research Project.

1. Executive Summary Period **: 01/07/2015 to 30/06/2018**
2. UGC reference no. **: F.No.43-532/2014 (SR) MRP-MAJOR-PHYS-2013-35168 dated 07/10/2015.**
3. Period of report : **from 11/12/2015 to 30/06/2018**
4. Title of research project :"**Studies on $CdSe_{0.6}Te_{0.4}$ Thin Films by Holographic Interferometry and Electron Irradiation for Photo electrochemical properties"**
5. (a) Name of the Principal Investigator : **Prof. (Dr.) V. J. Fulari**
   (b) Deptt. : Department of Physics,
   (c) University/College where the work has progressed : Shivaji University, Kolhapur (Maharashtra)
6. Effective date of starting of the project **:** 11/12/2015
7. Grant approved and expenditure incurred during the period of the report:

a. Total amount of approved Rs. 12,32,000/-

[Books and Journals : 20,000/-, Equipment: 8,50,000/-, Contingency: 1,20,000/- , Field Work/ Travel: 1,20,000/-, Chemicals & Glassware: 1,00,000/-, Overhead Charges: 22,000/-]

b. Total expenditure Rs. 10,27,715.41/-

[Equipment: 6,91,748.41/-, Contingency: 1,18,962/- , Travel/ Field Work: 95,603/- , Chemicals & Glassware: 99,402/- , Overhead Charges: 22,000/-]

Report of the work done:

i. Brief objective of the project : **Annexure A**

ii. (a) Work done so far and results achieved : **Annexure B**

(b) Publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication : **Annexure C**

iii. Has the progress been according to original plan of work and towards achieving the objective. if not, state reasons **Yes**

iv. Please indicate the difficulties, if any, experienced in implementing the project.

v. If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the Commission on a separate sheet.

vi. If the project has been completed, please enclose a summary of the findings of the study. One bound copy of the final report of work done may also be sent to University Grants Commission.

vii. Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any

Annexure A

Objective of the Project

- $CdSe_{0.6}Te_{0.4}$ thin films will be deposited by electrodeposition method
- Deposition of $CdSe_{0.6}Te_{0.4}$ thin film on to different conducting substrates like ITO, stainless steel, etc.
- For deposition of thin films with large surface area, optimization of deposition parameters such as, pH value, bath temperature, composition, deposition times, deposition potential, current density etc. will be studied.
- Effect of different thickness on photoelectrochemical cell performance of $CdSe_{0.6}Te_{0.4}$ thin film will be evaluated by varying deposition parameters (e.g. deposition time).
- Characterization of $CdSe_{0.6}Te_{0.4}$ thin films by using physico-chemical techniques such as X–Ray diffraction, Fourier transform infrared spectroscopy used for qualitative analysis. Scanning Electron Microscopy, Atomic Force Microscopy will be used for determination of surface morphology, FT-Raman spectroscopy.
- Use of electron beam irradiation will alter the morphology / structure of $CdSe_{0.6}Te_{0.4}$ thin films which will be useful for photoelectrochemical cell performance.
- Performance of $CdSe_{0.6}Te_{0.4}$ thin film in photoelectrochemical cell will be evaluated with respect to various parameters such as potential window, current efficiency, fill factor, etc.
- Structural, morphological, optical and holographic properties of $CdSe_{0.6}Te_{0.4}$ thin films

Annexure B

Details of Work done so far

- For deposition of thin films with large surface area, deposition parameters such as, pH value, bath temperature, composition, deposition times, deposition potential, current density etc. has been studied and optimized.
- $CdSe_{0.6}Te_{0.4}$ thin films has been synthesized by electrodeposition method for optimized parameters.
- Deposition of $CdSe_{0.6}Te_{0.4}$ thin film on to different conducting substrates like ITO, stainless steel, etc. has been carried out.
- Effect of different thickness on photoelectrochemical cell performance of $CdSe_{0.6}Te_{0.4}$ thin film has been evaluated by varying deposition parameters (e.g. deposition time).
- The deposited $CdSe_{0.6}Te_{0.4}$ thin films has been characterized by using physico-chemical techniques such as X–Ray diffraction, Fourier transform infrared spectroscopy used for qualitative analysis. Scanning Electron Microscopy, Atomic Force Microscopy will be used for determination of surface morphology, FT-Raman spectroscopy.
- The photoelectrochemical properties of the $CdSe_{0.6}Te_{0.4}$ thin films in various electrolytes.
- The effect of thickness on the photoelectrochemical properties of $CdSe_{0.6}Te_{0.4}$ thin films.
- The photoelectrochemical cell performance of $CdSe_{0.6}Te_{0.4}$ thin film in will be evaluated with respect to various parameters such as potential window, current efficiency, fill factor, etc
- Effect of electron beam irradiation on the $CdSe_{0.6}Te_{0.4}$ thin films
- Evaluation of photoelectrochemical cell performance of electron beam irradiated $CdSe_{0.6}Te_{0.4}$ thin film.
- Electrochemical impedance spectroscopy (EIS) studies of electron beam irradiated $CdSe_{0.6}Te_{0.4}$ thin film.

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16. WHETHERANYPh.D.ENROLLED/PRODUCEDOUTOFTHEPROJECT–**Yes.**

17. NO.OFPUBLICATIONSOUTOFTHEPROJECT(PLEASEATTACH) – **5**

PUBLICATIONS LIST

Sr. No.	Title of Paper	Authors	Name of Journal	Volume	Page No.	Year
1	Enhanced solar cell performance of electron beam irradiated CdS photoanode by electrodeposition method	S. K. Shinde, G. S. Ghodake, Ninad B. Velhal, M. V. Takale, D-Y Kim*, M. C. Rath, H. D. Dhaygude, V. J. Fulari*	Journal of Solid State Electrochemistry	21	1-6	2016
2	Enhanced photoelectrochemical properties of nanoflower-like hexagonal $CdSe_{0.6}Te_{0.4}$: Effect of electron beam irradiation	Surendra K. Shinde, Gajanan S. Ghodake, Deepak P. Dubal, Haridas D. Dhaygude,Dae-Young Kim**, Vijay J. Fulari*	Journal of Industrial and Engineering Chemistry	45	92-98	2016
3	Morphological modification of $CdSe_{0.6}Te_{0.4}$ nanostructures by electron irradiation and the effect on photoelectrochemical cells	Surendra. K. Shinde, G. S. Ghodake, D. P. Dubal, H. D. Dhaygude, D.-Y. Kim, M. C. Rath, V. J. Fulari*	Journal of Materials Science: Materials in Electronics	28	1976–1984	2017
4	Porous $CdSe_{0.6}Te_{0.4}$ nanoflowers-nanosphere: facileelectrochemical synthesis and excellent for photoelectrochemicalcell performance	S. K. Shinde, G. S. Ghodake, N. C. Maile, H. D. Dhaygude, Sungyeol Kim*, A. D. Phule, Rahul V. Patel, V. J. Fulari*	Ionics	23	2489-2496	2017
5	Structural, morphological, optical and holographic properties of $CdSe_{0.6}Te_{0.4}$ thin films synthesized using electrochemical method	V. J. Fulari*	Optik	Communi-cated	-	2018

(PRINCIPAL INVESTIGATOR)

Prof. (Dr.) V. J. Fulari
Principal Investigator
(UGC Major Research Project),
Holography and Materials Research Laboratory,
Department of Physics,
Shivaji University, Kolhapur-416 004 (India)

Annexure – XI

Final Report Assessment / Evaluation Certificate
(Two Members Expert Committee Not Belonging to the Institute of Principal Investigator)
(to be submitted with the final report)

It is certified that the major project report entitled **Studies on $Cdse_{0.6}te_{0.4}$thin films By Holographic Interferometry and Electron Irradiation for Photo Electrochemical Properties** by **Prof. V. J. Fulari, Department of Physics, Shivaji University, Kolhapur** has been assessed by the expert committee consisting the following members for final submission of the report to the UGC, New Delhi under the scheme of Major Research Project.

Comments/Suggestions of the Expert Committee:-

All the objectives of the project have been achieved. The project is executed as per UGC guidelines. The report is recommended for acceptance.

The project work fulfilled all the conclitions of research work, in accordance with objectives. project results are derived from most-sophisticated instruments and research students are fully benefited. Research dates can be used for social concern projects. Considering the merit of the project work its report can be recommended for acceptance.

Name & Signatures of Experts with Date:-

Name of Expert	University/College name	Signature with Date
1. **Dr. S. B. Kulkarni,**	Department of Physics, Institute of Science, Mumbai	14.08.18
2. **Prof. U. S. Raikar,**	Department of Physics, Spectroscopy, Karnataka University, Dharwad	Raikar 14/08/18

It is certified that the final report has been uploaded on UGC-MRP portal on .....

It is also certified that final report, Executive summary of the report, Research documents, monograph academic papers provided under Major Research Project have been posted on the website of the University/College.

(Registrar/Principal)
Seal

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