**CURRICULUM VITAE**



**1. Name : -** Dr. Anuradha Chandrashekhar Pawar

**2. Date of Birth : -** 09/11/1975

**3. Permanent Address : -** Flat No. 103, Shivsagar Park, Yeolekar Mala, College Road, Nasik – 422005.

**4. Email Address : -** anuradhapawar@gmail.com

**5. Education-Qualification:-**

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| --- | --- | --- | --- | --- |
| **Sr. No.** | **Degree** | **Year** | **University/Inst.** | **Class Obtained** |
| 1. | Post Ph.D. DST Fellowship  (Study of Space Solar Cells) | 2015 | ISRO Satellite Centre, India |  |
| 2. | Ph.D. (Solar Cell Materials) | 2015 | Pune, MS, India | Awarded |
| 3. | Master of Science (Physics) | 1997 | Pune, MS, India | First Class |
| 4. | Bachelor of Science (Physics) | 1995 | Pune, MS, India | First Class |

**6. Employment Record:-**

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| **Sr. No.** | **University/Employer** | **Designation** | **Period** |
| 1 | K. K. Wagh Institute of Engineering Education & Research, Panchavati, Nasik.- Pune University, India. | Assistant Professor | Oct. 2010 to Present |
| 2 | Brahma Valley Institute of Technical Education, Anjaneri, Nasik | Lecturer | Aug.2007 to Sep.2010 |
| 3 | K.K.Wagh Arts, Commerce and Science College, Nasik | Lecturer | Aug.2005 to July2007 |

**7. Awards / Achievements:-**

**A. Awarded**

**Summer Research Fellowship (SRF),** Indian Academy of Sciences, Bangalore to work at**:**

**Indian Space Research Organization (ISRO) Satellite Centre, Bangalore**

on topic: **Study of Radiation Damage in Space Solar Cells.**

**B. N.C.C. Under Officer with ‘C’ Certificate Graded ‘A’ in 1996.**

: Achieved Best Cadet Gold Medal in Annual Training Camp in 1993.

: Achieved Best Cadet Silver Medal in Republic Day selection Camp in 1994.

: Achieved Best Cadet Scholarship of Govt. of Maharashtra in 1995.

**C. Runner up in University level Project Exhibition: Avishkar 2012.**

**8. Experimental Knowledge:**

**A. Thin films synthesis using chemical deposition techniques:**

: Chemical bath deposition (CBD),

: Electrodeposition,

: Microprocessor based ‘Successive ionic adsorption and reaction’ (SILAR) unit etc.

**B. Characterization Instruments handled:**

: Zive SP5 electrochemical workstation,

: 8-channel automatic battery cycler,

: Current-voltage measurement unit with software,

: Programmable high temperature furnaces.

: Scanning electron microscopy (SEM, EDAX),

: UV-VIS spectrophotometer,

: Contact angle measurement (Rame-hart model 500-F1 USA),

: Four probe resistivity measurement unit,

: Solar Simulator, etc.

**C. Other known techniques and ability to interpret results:**

Scanning electron microscopy (SEM) and UV-Visible spectroscopy, with greater interest to study various instruments required for my research as well as the facilities available in the concerned research laboratory.

**9. Computer Skills:**

**Skillful in operating scientific software such as:**

: Origin, Xpert high score,

: EIS spectrum analyzer,

: Monte Carlo simulation software SRIM-TRIM,

: World Wide Web-based instrument intended to facilitate the use of models of the spatial

environment in a consistent and structured way i. e. Space Environment and Information

System (SPENVIS), commercially available solar cell modeling programs.PC1D5 etc.

**10. Publications:**

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| **A]** | **Book:**  **Basic Science (Physics)**, ISBN: 9789350871379, As per MSBTE’s New Revised G-Scheme, Diploma Engineering 1st Semester. |
| **B]** | **International Publications: 11** |
| [1] | “Photoelectrochemical cell based on electrodeposited nanofibrous ZnS thin film”, IEEE Transaction on Nanotechnology, Vol. 12 (6) (2013) 996-1001. (I. F. 2.2) |
| [2] | “Cadmium indium selenide semiconducting nanofibers by single step electrochemical route”, Modern Physics Letters B, 29(6-7) (2015) 154024-1 - 154024-5. (I. F. 0.64) |
| [3] | “ Effect of Different Modes of Electrodeposition on Photoelectrochemical Cell Performance of Nanocrystalline Zinc Selenide Thin Films”, Adv. Sci. Lett. 22, 759-765 (2016). ( I. F. 1.25) |
| [4] | " Theoretical Modeling of Radiation Damage in Silicon Solar Cells", International Journal of Chemical and Physical Sciences, ISSN:2319-6602, Vol. 5 (2016) 101-106. ( I. F. 1.8) |
| [5] | “Structural properties of single step electrochemically deposited ZnS nanofibers”, American Institute of Physics Conference Proceedings, 1536 (2013) 65-66. |
| [6] | “Crystalline zinc indium selenide thin film synthesis and its photoelectrochemical studies”, Elsevier, Energy Procedia 54 (2014) 540-556. |
| [7] | “Studies on growth kinetics of electrodeposited ZnIn2Se4 thin films”, Material Science Research India, Vol. 7(1) (2010) 295-299. |
| [8] | “Study of factors influencing electrodeposition of thin film”, Physics Education 30 (1) (2014) 17- 21. |
| [9] | “Comparative study of various deposition techniques for synthesis of solid thin films”, Everyman’s Science, Vol. XLIX (6) (2015) 368-376. |
| [10] | "Role of Physics Education in Sustainable Development of Technology", IJMER,  ISSN: 2249–6645, Vol. 6(5) ( 2016 ) 10-16. (I. F. 1.2) |
| [11] | “(Photo)electrochemical analysis of electrosynthesized nanofibrous cadmium indium selenide (CdIn2Se4) thin films”, Journal of Photochemistry and Photobiology A: Chemistry 336 (2017) 69-76 (I. F. 2.4) |
| [12] | “Substrate assisted electrosynthesis of patterned lamellar type nanocrystalline indium selenide (InSe) layer for photovoltaic application”, Submitted to Material Research Bulletin (I. F. 1.9) |
| **C]** | **Paper Presentation in International Conferences: 06** |
| [1] | “Study on formation mechanism of electrodeposited nanomaterials and ZnS thin film”, Nanocon 2012: International Coference on Nanomaterials, 18-19 October 2012, Bharati Vidyapeeth College of Engineering , Pune. |
| [2] | Recent Trends in Applied Physics and Material Science, RAM 013, 1-2 February 2013, Govt. College of Engineering and technology, Bikaner, Rajasthan. |
| [3] | “Study of Growth Kinetics and Structural Properties of Electrochemically Deposited ZnSe Thin Films”, Emerging Trends in Chemical Sciences, ETCS- 2012, 2-4 Nov. 2012, Solapur University, Solapur, Maharashtra. |
| [4] | “Crystalline zinc indium selenide thin film synthesis and its photoelectrochemical studies”, 4th international Conference on Advances in Energy Research, ICAER 2013 , 10-12 2013, IIT Bombay, Mumbai. |
| [5] | “Structural, Optical and Photoelectrochemical properties of Indium Doped Zinc selenide”, ICPM-MDF 2014, 13-15 January 2014, Department of Physics, Shivaji University, Kolhapur. |
| [6] | “Growth kinetics of zinc selenide nanocrystalline thin films using various modes of electrodeposition”, Nanocon 2014: International Coference on Nanomaterials, 14-15 October 2014, Bharati Vidyapeeth College of Engineering , Pune. |
| **D]** | **National level Presentations: 06** |
| [1] | “Synthesis of electrochemically deposited CdIn2Se4 optoelectronic thin film solar cell & it’s applications in green technology”, NCGT08 , 24-25.Oct.2008, Government Polytechnic College, Samangaon, Nasik. |
| [2] | “Preparation and characterization of zinc selenide thin films by various modes of electrochemical deposition”, NCPM-MDF2013, 4-5 January 2013, Shivaji University, Kolhapur. |
| [3] | “Role of physics in development of technology”, RPSD 7-9 FEB.2013, Sangamner College, Sangamner, Ahmednagar. |
| [4] | “Structural and optical properties of electrochemically deposited InSe thin films”, Materials for Future Technology, 26-27 Sept.2014, Rajaram College, Kolhapur. |
| [5] | “Study of radiation damage in silicon solar cells”, 13 Feb. 2016, Non-Conventional Sources of Energy, D. P. Bhosale College, Koregaon, Satara. |
| [6] | “ A facile route for synthesis of cadmium selenide nanofibers”, 13 Feb. 2016, Non-Conventional Sources of Energy, D. P. Bhosale College, Koregaon, Satara. |
| **11.** | **Other Activities:** |
| [1] | Life Member of the **Indian Science Congress Association, Kolkata**. |
| [2] | Assistant Program Officer of **N. S. S.** at K. K. W. Arts, Com., Science College, Nasik in Academic Year 2006-2007. |
| [3] | Co- Convener in Organizing **District Level** workshop on **Nanotechnology: Concept, Scope & Application** under **Quality Improvement Program** of **Pune University** in February 2007**.** |
| [4] | Organizer of one day workshop **“Vidyarthini Vyaktimatva Vikas”** under Student Welfare Organization of **Pune University** in December 2006**.** |
| [5] | Convener in organizing one day workshop **“Safety Awareness”** under Student Welfare Organization of **Pune University** in January 2007**.** |
| [6] | Convener in organizing Cultural Activities of Annual Social Function **‘UMANG-2006’** at K. K. W. Arts, Com., Science College, Nasik |
| [7] | Conducted various activities under **Science- Forum** to improve general awareness of students about science & to develop their scientific attitude in academic year 2006-2007.  i. Organized workshop on ‘**First Aid and Safety Awareness’.**  ii. Organized workshop on `**Human relations & Sex life’.**  iii. Essay competition on scientific topics.  iv. Debt competition. |
| [8] | Worked as **Editorial Committee** member of annual magazine’ **Srujan’** at K. K. W. Arts, Com., Science College, Nasik |
| [9] | As co-curricular activity organized **Study Visit** to **Hydro Power Project at Vaitarana Dam**, Tal. Igatpuri, Dist. Nasik. |
| [10] | Working as an **Anchor** in various social programs. |
| [11] | Successfully completed **“ YOGA – PARICHAY”**– Bhartiya Yog Vidya Dham , Nasik. |
| [12] | Successfully completed **Diploma in Computer Applications** in **1994.**  : Developed Agricultural Loan Management System for Central Bank of India in DBASE.  : Developed Simulations on Quantum Mechanics Topic: Bessel Function, Probability Distribution Function and Wave Function in FORTRAN. |
| [13] | Captain of Hockey Team at interzonal level, played state level and played inter zonal level Hockey 5 times. |
| [14] | Organized ‘Tree plantation program’ in association with ESOPs activity of Mahindra & Mahindra Ltd., Nashik on 10th August 2008. |
| [15] | Organized ‘Personality development workshop’ on the occasion of Youth Day, in co-ordination with Swami Vivekanand Kendra, Nashik on 12th Jan. 2009. |
| [16] | Co-ordinator of ‘Short Term Training Program in Engineering Physics’ conducted by IIT Bombay as a part of Continuing Education & Quality Improvement Program during 8th Dec. 2015 to 18th Dec. 2015 |

**12. Areas of Interest:-** Material Research, Next Generation Solar Cell, General Science,

Physics Education, Time Management, Soft Skill Development,

Standardization of academic systems.

**Areas of Research Interest: -** Material Research: Thin film, Nanomaterials,

Next Generation Solar Cell, Supercapacitor

**Research Plan:-** Pervoskite material synthesis for solar cell application.

**13. Areas of Teaching Interest: -** Optics, Properties of Matter, Solid State Physics, Thermodynamics, Electricity and Magnetism

**P.S.: Pl. consider Anuradha B. Bhalerao as Dr. Anuradha C. Pawar for research publications.**

**Dr. Anuradha C. Pawar**

**References**

**1.** **Prin. (Dr.) B. G. Wagh (Ph. D. Guide)**

*Brain Pool fellow, South Korea*

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**2. Prof.  (Dr.) C. D. Lokhande (Ph. D. Guide)**

*Alexander Von-Humboldt Fellow, Germany*

*Brain Pool fellow, South Korea*

  Professor, Head and Coordinator, International Cooperation Cell

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           Maharashtra, India

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**3. Dr. K. Sankarsubramanian (Fellowship Guide)**

Dy. Division Head,

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**4. Dr. S. D. Sartale**

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**Personal Level Research Work Abstract**

Since, last 7 years of my research career I am working on Electrochemical Photovoltaic (ECPV) solar cell electrode materials such as metal chalcogenides with the exploitation of chemical methods for cost effectiveness. Simultaneously, I am working on theoretical modeling of degradation of these materials and standard silicon and GaAs solar cells under space environment.

Keeping in mind numerous advantages of electrodeposition technique and of nanocrystalline ZnS, InSe, ZnSe,ZnIn2Se4**,** CdSe, CdIn2Se4 thin film materials, it was planned to deposit these thin films by potentiostatic electrodeposition technique as my doctoral work under the guidance of Prof. C. D. Lokhande at Department of Physics, Shivaji University, Kolhapur and Prin. Dr. B. G. Wagh at Pune University, Pune.

Deposited thin films were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), optical absorption and contact angle measurement techniques. XRD analysis has been done to determine crystal structure, different phases and average crystallite size of film material. The surface morphology of the films was studied using SEM. Optical absorption and surface wettability study was carried out to determine optical band gap ‘Eg’ and contact angle between thin film surface and water, respectively.

In this work, (photo)electrochemical analyses of electrosynthesized ZnS, InSe, ZnSe, ZnIn2Se4, CdSe and CdIn2Se4 thin film photoelectrode have been carried out. The current-voltage (I-V) characteristics of these photoelecrodes have also been studied by forming electrochemical photovoltaic cell. I-V characteristics in dark and under light used to determine type of conductivity and various photovoltaic quantities such as open circuit voltage (VOC), short circuit current (ISC), fill factor (FF %) and conversion efficiency (η %). The spectral response study is used for the estimation of optical response of thin films in wavelength range of solar spectrum. The transient photoresponse and speed response characteristic study was carried out to study performance, stability and photosensitivity of thin film materials.

The performance of ECPV cell is analysed with the help of capacitance-voltage (C-V) characteristics, energy band diagram and electrochemical impedance spectroscopy. The flat band potential and charge carrier density of the electrosynthesized ZnS, InSe, ZnSe, ZnIn2Se4, CdSe and CdIn2Se4 photoelectrodes have been determined from the C-V plots and these values have been utilized for drawing energy level diagram. Further, electrochemical impedance spectroscopic (EIS) study has been carried out to determine circuit parameters.

This work explores photovoltaic properties of zinc sulfide, indium selenide, zinc selenide, zinc indium selnenide, cadmium selenide and cadmium indium selenides with the help of ECPV cell, so that in next stage we can move forward and combine these basic interfaces to form more advanced photovoltaic devices. The relation between energy band gap, material resistance, contact angle and crystallite size has been established with electrochemical performance of the film so that in future we can easily move up with these parameters.

Further, as a part of SRF I worked with Space Astronomy Group of Indian Space Research Organization (ISRO) Satellite Centre at Bangalore, India under the guidance of Dr. K. Sankarsubramanian and Dr. Anil Agrawal. This work was intended to study factors affecting life of solar cells under space environment, so as to implement this study for increasing their conversion efficiency. Brief introduction of this work is mentioned below.

The near earth and interplanatory space environment radiation field can be extremely harmful to spacecraft electronics. The solar cell radiation response strongly affects full capability of the spacecraft and ultimately mission's lifetime. To increase life of solar cells, the cell material should have radiation resistance property. Theoretical understanding of radiation response controlling mechanism and developing simulations shows the correlation between radiation effects and solar cell performance. In this work study related to methods of modelling radiation degradation in solar cells and modelling of electrical parameters of solar cells after degradation was carried out. It focuses on the primary basic mechanism for solar cell radiation damage, displacement damage, so as to predict performance of solar cell after irradiation with particular fluence spectra. This modelling will also be helpful to obtain more radiation resistant devices.

Hence, this work adds study of basic interfaces for future perspective in exploring the right materials and their properties to absorb light and create charge carriers effectively. Thus, material study when interlinked with manufacturability will enhance the matured knowledge in establishment of low cost semiconducting technology for the development of photovoltaic industries. Related work is published in reputed international journals. I made significant contribution in the field of nanostructured thin films: Preparation, degradation and applications. Several papers have been presented in various national and international conferences. I have great interest to work on application of thin films in the field of energy production and storage.