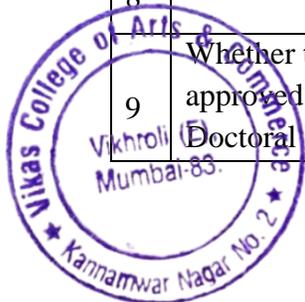


## MINOR RESEARCH PROJECT PROPOSAL

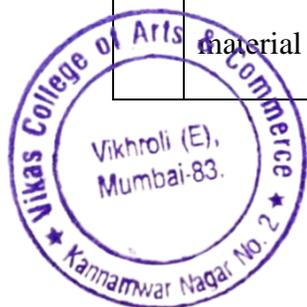
PART – A : GENERAL INFORMATION			
1	Basic Subject area of Research	:	Physical Sciences
2	Title of the Proposed Project	:	CdZnSe thin film electrodes for photo electrochemical Cells
3	Name, Qualification and Designation of the Principal Investigator/Co-Investigator	:	Principal Investigator: Name: Mrs. Prajakta P Borgaonkar Sex: Female Date of birth: 20/11/1977 Qualification: M.Sc, M.Phil Designation: Assistant Professor. Physics
		:	Co-Investigator: Name : Mr. Shaji Mathew Sex: Male Date of Birth: 17/04/1965 Qualification: M.Sc, M.Phil Designation: Assistant Professor Mathametics
4	Teaching and Research Experience of Principal Investigator	:	16 years of Teaching experience at Undergraduate level.
5	Name and address of the institution where the proposal will be executed	:	Vikas College Of Arts, Science and Comm. Kannamwar Nagar 2, Vikhroli(East), Mumbai 400083
6	Whether the College / University is approved by the UGC	:	Yes
7	Details of Facilities provided/to be made available at the College / University	:	1) Water & Electricity 2) Laboratory space & furniture 3) Telecommunication 4) Administrative & secretarial support 5) Library 6) Computation\ Documentation 7) Computer laboratory with Internet facility
8	Have you ever applied before for Minor Research Project If yes, give details	:	No
9	Whether the Project or part of Project is approved by the University for the Doctoral Degrees If Yes, give details	:	No



  
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10	Details of the Research Project and research funding (Major/Minor) received in the past and/ongoing projects.	:	NIL
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<b>PART – B : PROJECT DETAILS</b>	
1	Details of the proposed project to be undertaken: (Attach additional Pages if required)
	<p><b><u>Origin, Need and Objective of the Research Proposal :</u></b></p> <p>Now a day's complicated electronic structures can easily be constructed by thin films. Thin films are commonly used as deposit on a substrate for integrated optical circuits, capacitors, transistors etc, and metal chalcogenide thin films are important because of their numerous applications. CdSe thin films (band gap 1.72 eV) and ZnSe thin films(band gap m2.7 eV) are commonly used in photovoltaic cells. CdSe undergoes photo corrosion when used in certain electrolytes whereas ZnSe is less photoactive but more stable. The incorporation of cadmium (<math>Cd^{+2}</math>) ions into ZnSe lattice to form Cd ZnSe ternary system, enables a tuneable band gap region and facilitates the development of several optoelectronic devices. Therefore the objective of this research projects is “To deposit Cd ZnSe thin films with proper stoichiometric ratio of Cd, Zn and Se by chemical bath deposition method and to study their various characteristics for using them as an electrode for photoelectrochemical cells.”</p>
	<p><b><u>Rationale for taking up the proposed project and its interdisciplinary relevance :</u></b></p> <p>The wide band gap II – IV semiconductor thin films have been attracting considerable attention during the last few decades due to their wide applications in Lasers, sensors, transistors, photo electrodes LED and solar cells. CdZnSe is a n- type semiconductor material and has interesting size dependent properties as well as high stability and wide band</p>



  
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gap which covers the maximum electromagnetic spectrum.

The metal chalcogenide thin films can be prepared by using various physical and chemical techniques such as Molecular Beam Epitaxy (MBE), vacuum evaporation, sputtering, electron beam pumping, spray pyrolysis and Chemical Bath Deposition (CBD) etc. Among these CBD is a simple technique for synthesizing good quality films with better stoichiometry, suitable for device applications. Structural, morphological and optical properties of these CdZnSe thin films have to be characterised through X-ray diffraction (XRD), scanning electron microscope (SEM), energy dispersive X-Ray analysis (EDS), AFM and UV Visible techniques.

#### **Review of Research and Development in the field :**

The present commercial energies are based on the fossil and nuclear fuels which have dangerous consequences on our environment. In order to avoid that, research is going on to find clean and renewable energies to meet energy crises. Recent research is going on in the development of photoelectrochemical cells of regenerative type, which converts solar energy directly into electrical energy. Literature review indicated that the synthesis and various properties of ZnSe, CdSe, Cds, HgSe, ZnSeect. metalchalcogenide thin films are widely studied by various researchers for their use in photoelectrochemical cells.

There are many techniques available in recent time used by many researches in the deposition of thin films on various substrates. Chemical bath Deposition technique is more suitable considering its various advantages like low cost scalability, its simplicity of handling and possibility of deposition of multi-component chalcogenide thin films over a wide range of stoichiometry. In Chemical Bath deposition technique, chemical reaction plays an



  
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important role during the deposition of thin film and the rate of deposition can be controlled by adjusting parameters like bath Temperature, pH of the solution, stirring rate, immersion time and relative concentration of solutions in the bath. The thin films of CdZnSe deposited by optimising all above parameters can be used in optoelectronic devices by characterising them through various techniques.

**Relevance to social benefit by this R&D in the proposed area :**

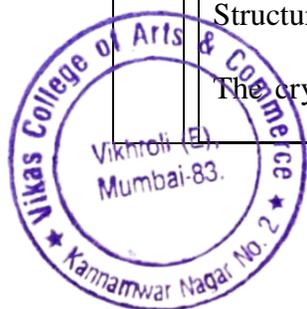
Today, various application areas are emerging and focusing on the use of nanoparticles as a technology for the development and progress of all the spheres of life, i.e. social, industrial and economical. From the viewpoint of science and technology, the main purpose of the preparation of thin films on suitable substrates is to design a system for the improvement in the performance of the devices made up of it. The thin films of CdZnSe have great importance and significance in a large variety of industrial applications. Earlier, various workers have reported the synthesis of CdZnSe thin films by a variety of techniques and extensively studied their structural and optical properties. These thin films can be used either as the basic material for the fabrication of solar cells or as the photoelectrodes for the large area deposition of other semiconducting materials for solar cell purposes. They can also be used as photocatalysts for the generation of hydrogen in the form of fuel used as the alternative source of energy, by water splitting. Renewable energy sources have a great contribution to create a sustainable energy system. Further research and developments in the applications of CdZnSe thin films can give a boost to the betterment of this energy



  
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**Work plan (including Detailed Methodology and Time Schedule) :**

<b>Working Methodology</b>	<b>Time Schedule</b>
<p><b>1. Deposition of CdZnSe thin films</b></p> <p>CdZnSe thin films will be prepared by varying the composition parameter of Cd,Zn,Se by Chemical Bath Deposition method. A mixture of aqueous solutions of cadmium sulphate, zinc sulphate and sodium selenosulphate will be used in the appropriate volume stoichiometric ratio. Triethanolamine (TEA) will be used as complexing agent and sodium hydroxide (NaOH) will adjust the PH values. The deposition parameters like deposition time, deposition temperature, pH of the reaction mixture, molarity of the basic ingredients and speed of mechanical churning etc. will be optimized to get quality films.</p>	<p>October' 2019 to Dec December'2019</p>
<p><b>2. Physical and Compositional properties</b></p> <p>Thickness of the deposited films will be determined by mass – density difference method and also by interferometry. Compositional analysis which confirms the formation of CdZnSe mixed thin films will be carried out by EDS / EDAX (energy dispersive X –Ray technique)</p>	<p>January'2020</p>
<p><b>3. Structural studies</b></p> <p>Structural analysis will be done using X-ray diffraction method. The crystallographic studies will be carried out to understand</p>	<p>February '2020</p>



  
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	crystal lattice, interplaner distances, crystallite sizes etc. of these thin film samples.	
	<p><b>4.Surface morphological studies</b></p> <p>The surface morphology of the deposited <math>Cd_xZn_{1-x}Se</math> thin films on glass substrate grown under different concentrations will be reviewed two dimensionally through scanning electron microscope SEM at different magnifications so as to get clear sight about the crystallite size.</p> <p>AFM analysis will be done to study surface morphological features of different CdZnSe thin films to determine surface roughness.</p>	Feburay'2020
	<p><b>6. UV- visible absorption studies.</b></p> <p>The fundamental absorptions which correspond to the transition from valence band to the conduction band can be used to determine the optical band gap of the material. Transmittance and absorption spectra will be obtained for all the thin films to calculate the band gap and absorption coefficient</p>	March'2020
	<b>5. Analysis of the characteristics studied by above methods.</b>	March'2020
	<b>6. Result, Conclusion and Report writing.</b>	April'2020
2	<b><u>Collaboration for the proposed project (if any) :</u></b>	



  
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	NIL		
3	<b>Details of financial requirements with justification :</b>		
	<b>Sr. No.</b>	<b>Head</b>	<b>Amount (Rs.)</b>
	1	Consumables and Chemicals	10000
	2	Equipments (minor)	10000
	3	Travel	20000
	4	Books & peripheral	5000
	5	Contingency	20000
		<b>Total</b>	65000
4	<p><b>Any other information in support of the proposed project :</b></p> <p>Instrumental facilities like constant temperature bath, hot air oven, autoclave, muffle furnace, UV spectrophotometer etc are available in the institute under various departments.</p> <p>Characterization will be done through different research laboratories as per their availability.</p>		



  
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Vidya Vikas Education Society's

# VIKAS COLLEGE OF ARTS, SCIENCE & COMMERCE

Affiliated to University of Mumbai

RE-ACCREDITED 'A' GRADE BY NAAC (WITH CGPA 3.15)

ISO 9001 : 2015 CERTIFIED

Vikas High School Marg, Kannamwar Nagar No. 2, Vikhroli (E), Mumbai - 400 083.

Phone : 257 84267 / 257 83540 Fax : 257 96196

**Dr. R. K. Patra**  
Principal

**Hon'ble Shri. P. M. Raut**  
Chairman. V. V. Edu. Society

Email : [vikascollegeprincipal@gmail.com](mailto:vikascollegeprincipal@gmail.com)

[www.vikascollege.org](http://www.vikascollege.org)

Ref No. Off 310/2019-20

Date: 28.09.2019

To,  
The Assistant Registrar  
Academic Planning and Development,  
Section No. 132. First Floor  
University of Mumbai,  
Fort, Mumbai 400032

Certified that

- I. the University/College is approved under Section 2 (1) and 12-B of the UGC Act.
- II. The institute welcomes participation of Prof. Prajakta P. Borgaonkar, as the Principal Investigator in the Proposed Minor Research Project entitled "Sustainable approach for municipal wet waste management and to analyses efficacy of the prepared compost by pure culture method" And she will assume full responsibility for implementing the project agency.
- III. The above research project/part of project is not funded by any other funding IV. The grant-in-aid received for the Research Project will be used to meet the expenditure of the project and the period for which the project has been sanctioned. responsibilities of the Project and
- V. Institute undertakes the financial and other management undertake to submit Grant Utilization Certificate and Project Report to the University. Infrastructure and other required
- VI. The Institution will provide in-house equipments and basic facilities like administrative facilities to the investigator.



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