

# Profile of

## **Dr. Dibya Jyoti Borah**

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**Address of Corresponds:** Assistant Professor, Department of Physics,  
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PIN-785106

**Nationality:** Indian      **Religion:** Hinduism      **Caste:** General

**Marital Status:** Single      **Language Skills:** Assamese, English, Hindi



### Academic Qualifications:

- **Ph. D. in Physics: Dibrugarh University, Dibrugarh, 2023 (Supervisor-Dr. A.T.T. Mostako)**
- **M. Phil. in Physics: Dibrugarh University, Dibrugarh, 2018 (Supervisor-Dr. A.T.T. Mostako)**
- **M.Sc. in Physics: Dibrugarh University, Dibrugarh, 2013**
- **B.Sc. in Physics: Bahona College, Dibrugarh University, 2011**
- **HSSLC: C.S. Rawanapar Model H.S. School, Majuli, 2008**
- **HSLC: Milon Jyoti High School, Majuli, 2006**

### Awards/Accomplishments:

- **“Best Oral Presenter Award”** on the topic of research entitled “Estimation of optical dispersion parameters of Molybdenum Oxide thin films”-An International Conference on Advances in Nano-Optoelectronics and its Applications (ICANOPA-2020) held in 12<sup>th</sup> to 14<sup>th</sup> October, 2020, organized by Department of Physics, Rajiv Gandhi University, Doimukh, Arunachal Pradesh, India
- **Qualified Joint CSIR-UGC NET for Lectureship in Physical Sciences held in India, December, 2015 and secured 50<sup>th</sup> rank**
- **“Bahona College Talent Award”** for obtaining 1<sup>st</sup> Class with Distinction, Major in Physics, in last TDC III year Science examination held under Dibrugarh University in 2011
- **“Departmental Incentive Award”** for obtaining 1<sup>st</sup> Class with Distinction, Major in Physics, in last TDC III year Science examination held under Dibrugarh University in 2011
- **“Anundoram Borooah Award”** for securing 1<sup>st</sup> Division in HSLC Examination, 2006

### Professional Work Experience:

- **September 2023-Present:** Assistant Professor at Majuli College, Majuli, Assam, India
- **July 2023-August 2023:** Postdoctoral Fellow at CIMPLE-PSI Laboratory, Centre of Plasma Physics-Institute for Plasma Research (CPP-IPR) Sonapur, Guwahati, Assam, India
- **September 2017-June 2023:** Researcher at Material Science Laboratory, Department of Physics, Dibrugarh University, Dibrugarh, Assam, India
- **August 2016-August 2017:** Assistant Professor at Majuli College, Majuli, Assam, India

- **August 2015-July 2016:** Subject Teacher at Meragarh Narayan Dev Higher Secondary School, Majuli, Assam, India

#### Software Skills:

- Gatan Digital Micrograph, Origin 8.5, Image J, Microsoft Office Word Excel Access Power Point Outlook

**ResearchGate Profile:** [https://www.researchgate.net/profile/Dibya-Borah?ev=hdr\\_xprf](https://www.researchgate.net/profile/Dibya-Borah?ev=hdr_xprf)

**Google Scholar Profile:** <https://scholar.google.com/citations?hl=en>

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**Scopus ID:** 57205305157

#### Areas of Interest:

- Fabrication/synthesis of transition metal oxides thin films/quantum dots (QDs) and 2D transition-metal-dichalcogenides for optoelectronic device and gas sensor applications
- Growth of crystalline QDs/nanoparticles (NPs) employing a modified top-down approach
- Gaining insight nature of defects, opto-structural relationships between thin film and QDs/NPs
- Growth of 2D nanomaterials and their surface functionalization for achieving highly sensitive and selective sensors, and for the application of photocatalysts and optoelectronic devices
- Synthesis of II-VI semiconductor QDs/NPs for photovoltaic application
- Graphene oxide-transition metal oxides nanocomposites for gas sensor applications

#### Research Experience:

- Ph.D. thesis entitled “*Studies on Transition Metal Oxides (MoOx and WOx) Thin Films, Nanostructures and Quantum Dots for Gas Sensor Applications*”. The research work includes transition metal oxide (TMO) thin films fabrication by thermal evaporation technique and their investigations on temperature-dependent thickness and refractive index via R. Swanepoel’s envelope method, dispersion parameters via Wemple-DiDomenico (WDD) single oscillator model, microstructural parameters via Scherrer’s formula; modified models of Williamson-Hall (W-H) analysis viz. uniform deformation model (UDM), uniform stress deformation model (USDM), and uniform deformation energy density model (UDEDM); and size-strain-plot (SSP) methods. Interestingly, this research work is also an attempt to contribute in the direction of establishing a highly reliable modified top-down approach for synthesizing TMOs QDs. This method is a combination of thermal evaporation and sonication induced chemical etching process. The advantage of this approach is that this approach can be performed without using surfactants. Tunable size, shape, surface morphology, and their crystalline phase of QDs are successfully obtained by controlling the sonication parameters viz. sonication frequency, duration, temperature of the sonication bath, and etchant concentration.

My Ph.D. thesis has explored several novel aspects to optimize the quality of thin films and QDs. The thin films and QDs were thoroughly characterized by SEM, FESEM, FETEM, XRD, FTIR spectrometer, micro-Raman spectrometer, UV-Visible spectrometer, Fluorescence spectrometer, and Keithley Sourcemeter employing four-point probe method. My research work is oriented towards the optimization of thin film deposition parameters and QDs synthesis sonication parameters, and investigation on various properties and their correlations for enhancement of chemical gas sensing ability. At the optimum deposition parameters and sonication parameters of these films and QDs, a comparative investigation on the relative acetone sensing performance between the MoOx film and its QDs; WOx film and its QDs, are also performed. The operating temperature as well as particle size dependent acetone sensitivity of the synthesized QDs were also investigated.

- Completed M.Phil. Degree in Physics with research entitled “*Optical, Crystal Structural and Surface*

***Morphological Studies on Thermally Evaporated Molybdenum Oxide Thin Films***". The research work explored different optical constants of thermally evaporated Molybdenum Oxide thin films and correlates with their structural properties by systematic variation of thin film deposition parameters viz. source-substrate-distance and post-deposition annealing temperature. Higher post-deposition annealed films exhibit good optical quality and surface morphology with large pores and microscopic cracks, and can be exploited for fabricating gas sensors.

- Fabrication of Molybdenum Oxide/Tungsten Oxide thin films via Multipurpose Vacuum Coating Unit
- Synthesis of MoO<sub>3</sub>/WO<sub>3</sub> QDs /NPs via modified top-down approach
- Developed the MoO<sub>3</sub>/WO<sub>3</sub> thin film-/ QDs-based acetone sensor
- Fabrication of Molybdenum Disulfide (MoS<sub>2</sub>) thin films via vapour-plasma mixing technique and investigate their microstructural properties
- Synthesis of Cadmium Telluride (CdTe) QDs with tuneable sizes and crystalline phases via sonication induced wet chemical approach
- ***Experimental techniques handled:*** Resistive Thermal Evaporation, RF Sputtering, Multipurpose Vacuum Coating Unit, Vapour-Plasma Mixing, Sonication, Reflux, Magnetic Stirring, Programmable Temperature-Controlled Vacuum Oven
- ***Characterization techniques handled:*** UV-Visible Spectrophotometer, Keithley Sourcemeater

#### **Research Publications (Journal Existing in the Data Base of Scopus / Web of Science):**

- "Exploring the correlation of temperature-dependent optical properties of Tungsten Oxide thin films", **Dibya Jyoti Borah**, and A.T.T. Mostako. (***Manuscript under preparation***)
- "Unravelling the role of synthesis conditions on the size and crystalline phase of WO<sub>3</sub> nanoparticles for efficient room temperature acetone gas sensing", **Dibya Jyoti Borah**, A.T.T. Mostako, and A. Malakar. (***Manuscript submitted***)
- "Radio-frequency controlled crystalline phase transformation of MoS<sub>2</sub> thin film fabricated by unique vapour-plasma mixing technique", A.T. Borgogoi, **Dibya Jyoti Borah**, and A.T.T. Mostako, ***Physica B: Condensed Matter 660 (2023) 414896***. (ISSN: 0921-4526, **Impact Factor: 2.988**)
- "An investigation on the structural and optical properties of mercaptosuccinic acid capped cadmium telluride quantum dots", **Dibya Jyoti Borah**, D. Saikia, A. Das, P.K. Saikia, and A.T.T. Mostako, ***Discover Materials 3:4 (2023) 1***. (ISSN: 2730-7727, **Impact Factor: N/A**)
- "Tuning temperature-dependent microstructural properties of tungsten oxide thin films for acetone sensor", **Dibya Jyoti Borah**, A.T.T. Mostako, R. Chetia, S. Konwer, and M. Paul, ***Journal of Materials Science: Materials in Electronics 33 (2022) 19854-19870***. (ISSN: 0957-4522, **Impact Factor: 2.779**)
- "Tailoring the crystalline phase and size of the MoO<sub>3</sub> quantum dots via sonication induced modified top-down method", **Dibya Jyoti Borah**, A.T.T. Mostako, and A. Malakar, ***Journal of Alloys and Compounds 891 (2021) 161870***. (ISSN: 0925-8388, **Impact Factor: 6.371**)
- "Influence of Cd content on structural and optical properties of chemical bath deposited Cd<sub>x</sub>Pb<sub>1-x</sub>S thin films", Lipika Gogoi, S. Chaliha, **Dibya Jyoti Borah**, and P.K. Saikia, ***Bulletin of Material Science 44:225 (2021) 1-12***. (ISSN: 0250-4707, **Impact Factor: 1.825**)
- "Investigation on dispersion parameters of Molybdenum Oxide thin films via Wemple-DiDomenico (WDD) single oscillator model", **Dibya Jyoti Borah** and A.T.T. Mostako, ***Applied Physics A 126:818 (2020) 1-13***. (ISSN: 0947-8396, **Impact Factor: 2.983**)
- "Modified top-down approach for synthesis of molybdenum oxide quantum dots: sonication induced chemical etching of thin films", **Dibya Jyoti Borah**, A.T.T. Mostako, Angshuman T. Borgogoi, P.K. Saikia, and A. Malakar, ***RSC Advances 10 (2020) 3105-3114***. (ISSN: 2046-2069, **Impact Factor: 4.036**)

- “Effect of thickness and post deposition annealing temperature on the structural and optical properties of thermally evaporated molybdenum oxide films”, **Dibya Jyoti Borah**, A.T.T. Mostako, P.K. Saikia, and P. Dutta, *Materials Science in Semiconductor Processing* **93 (2019) 111-122**. (ISSN: 1369-8001, Impact Factor: 4.644)

#### Books:

- “*Recent Trends in Material Science Research*”, **Dibya Jyoti Borah** and Sumbit Chaliha. (In press)

#### Book Chapters:

- “A Synoptic Review of Tungsten Oxide Quantum Dots and Nanocomposites: Synthesis to Applications”, **Dibya Jyoti Borah**, *Recent Trends in Material Science Research*. (In press)
- “Investigation on optical dispersion parameters of Molybdenum Oxide films”, **Dibya Jyoti Borah** and A.T.T. Mostako, *Advances in Electronic Materials*, **2022, pp 57-67**. (ISBN: 978-81-948719-8-9)
- “Molybdenum Oxide - From Thick Film to Quantum Dots”, **Dibya Jyoti Borah** and A.T.T. Mostako, *Progresses in Material Science*, **2021, pp 25-35**. (ISBN: 978-93-5473-472-4)
- “Annealing Effect on the Optical Constants of WO<sub>3</sub> Thin Films”, **Dibya Jyoti Borah** and A.T.T. Mostako, *Advanced Functional Composite Materials and Applications*, **2021, pp 13-14**. (ISBN: 978-93-85434-37-2)
- “Molybdenum Oxide Quantum Dots: Recent Developments in Synthesis, Properties, and Applications”, **Dibya Jyoti Borah**, *Recent Progress in Material Science and Its Applications*, **2020, pp 47-61**. (ISBN: 978-81-949108-0-0)

#### National/ International Conference Presentations:

- “An investigation on the structural and optical properties of MSA capped CdTe quantum dots”, **Dibya Jyoti Borah**, D. Saikia, A.K. Das, P.K. Saikia, and A.T.T. Mostako, 14<sup>th</sup> to 16<sup>th</sup> December, 2022, CMDAYS, 30<sup>th</sup> National Conference on Condensed Matter Physics organized by Department of Science and Humanities, National Institute of Technology Nagaland, India. **(Oral Presentation)**
- “A comparative study on the microstructural parameters of WO<sub>3</sub> thin films estimated by Scherrer, Williamson-Hall, and Size-Strain plot method”, **Dibya Jyoti Borah** and A.T.T. Mostako, 29<sup>th</sup> to 30<sup>th</sup> April, 2022, NCPS, National Conference on Physical Science organized by Department of Physics, DHSK College, Dibrugarh, Assam, and Department of Physics, Manipur University, Manipur, India. **(Oral Presentation)**
- “Acetone sensors based on MoO<sub>3</sub> thin film and quantum dots: a comparative study”, **Dibya Jyoti Borah**, A.T.T. Mostako, and A. Malakar, 27<sup>th</sup> to 29<sup>th</sup> January, 2022, ICETNMST, International Conference on Emerging Trends in Nanomaterials Science and Technology organized by Department of Science and Humanities, National Institute of Technology Nagaland, India. **(Oral Presentation)**
- “Crystal structural, optical, and electrical characterization of Tungsten Oxide thin films”, **Dibya Jyoti Borah** and A.T.T. Mostako, 26<sup>th</sup> to 28<sup>th</sup> October, 2021, CONIAPS-XXVII, 27<sup>th</sup> International Conference of International Academy of Physical Sciences organized by Department of Physics, NERIST, Nirjuli, Itanagar (Arunachal Pradesh) in association with International Academy of Physical Sciences, Prayagraj (U.P.), India. **(Oral Presentation)**
- “Annealing Effect on the Optical Constants of WO<sub>3</sub> Thin Films”, **Dibya Jyoti Borah** and A.T.T. Mostako, 28<sup>th</sup> to 29<sup>th</sup> June, 2021, NCAFMCM, National Conference organized by Department of Physics, Academy of Maritime Education and Training (AMET), Chennai, Tamil Nadu, India. **(Oral Presentation)**
- “Synthesis of mixed crystalline phases: h- and α-MoO<sub>3</sub> QDs and its phase transformation”, **Dibya Jyoti Borah**, A.T.T. Mostako, and A. Malakar, 16<sup>th</sup> June, 2021, NCETP, National Conference organized by Department of Physics, Tezpur University, Tezpur, Assam, India. **(Oral Presentation)**

- “**Estimation of optical dispersion parameters of Molybdenum Oxide thin films**”, **Dibya Jyoti Borah** and A.T.T. Mostako, 12<sup>th</sup> to 14<sup>th</sup> October, 2020, ICANOPA, International Conference organized by Department of Physics, Rajiv Gandhi University, Doimukh, Arunachal Pradesh, India. (**Best Oral Presenter Award**)
- “**The size and phase evolution of MoO<sub>3</sub> QDs as a function of etchant concentration**”, **Dibya Jyoti Borah**, A.T.T. Mostako, A. Malakar, and Angshuman T. Borgogoi, 20<sup>th</sup> to 22<sup>th</sup> February, 2020, ESTEC, International Conference organized by CSIR-NEIST, Jorhat, Assam, India. (**Poster Presentation**)
- “**Investigation on the correlation of optical constants of MoO<sub>3</sub> thin films with substrate temperature**”, **Dibya Jyoti Borah**, A.T.T. Mostako, and Angshuman T. Borgogoi, 4<sup>th</sup> to 6<sup>th</sup> February, 2020, PMSR, National Conference organized by Department of Physics, Dibrugarh University, Dibrugarh, Assam, India. (**Oral Presentation**)
- “**Synthesis of MoO<sub>3</sub> QDs via modified top-down approach**”, **Dibya Jyoti Borah**, A.T.T. Mostako, A. Malakar, and Angshuman T. Borgogoi, 26<sup>th</sup> to 28<sup>th</sup> September, 2019, NSW-ANBDL, National Seminar organized by IQAC, Sibsagar College, Joysagar and CPP-IPR Sonapur, Assam, India. (**Poster Presentation**)
- “**Investigation on the correlation of optical constants of MoO<sub>3</sub> films with post deposition annealing temperature**”, **Dibya Jyoti Borah**, and A.T.T. Mostako, 4<sup>th</sup> to 6<sup>th</sup> March, 2019, NCHSCMP, National Conference organized by Department of Physics, Tezpur University, Tezpur, Assam, India. (**Poster Presentation**)
- “**Effect of post deposition annealing temperature and source-substrate distance on crystal structure and surface morphology of thermally evaporated molybdenum oxide films**”, **Dibya Jyoti Borah**, A.T.T. Mostako, and P.K. Saikia, 21<sup>th</sup> to 23<sup>th</sup> November, 2018, PANE, National Conference organized by Department of Physics, Assam University, Diphu Campus, Diphu, Assam, India. (**Poster Presentation**)

#### Workshop/ School/Symposium attended:

- A one day online webinar on “**Sustainable Energy Technologies part II**” organized by School of Energy Science and Engineering, Indian Institute of Technology Guwahati (IITG), Assam, held on 18<sup>th</sup> February, 2022
- A five days AICTE Training and Learning (ATAL) Academy online elementary Faculty Development Programme (FDP) on “**Recent Advances in Nanoscience and Nanotechnology**” organized by Centre of Nanotechnology, Rajasthan Technical University, Kota, Rajasthan, held from 17<sup>th</sup> to 21<sup>th</sup> January, 2022
- A three days online event of the ChemSci: LITF series “**ChemSci2021: Leaders in The Field Symposium**” organized by RSC’s flagship journal Chemical Science and JNCASR Bangalore, held from 13<sup>th</sup> to 15<sup>th</sup> December, 2021
- A five days AICTE Training and Learning (ATAL) Academy online elementary Faculty Development Programme (FDP) on “**Current Trend in Engineering Nano-Materials, Characterizations & Their Applications**” organized by Department of Physics, Indira Gandhi National Tribal University, Amarkantak, held from 6<sup>th</sup> to 10<sup>th</sup> December, 2021
- A three days online workshop on “**Instrumentation and Applications of Trace Elemental Analysis and Electron Microscopy**” organized by Sophisticated Analytical Instrument Facility (SAIF), North-Eastern Hill University (NEHU), Shillong, Meghalaya, held from 24<sup>th</sup> to 26<sup>th</sup> November, 2021
- A two days webinar and online training program on “**Raman Spectroscopy**” jointly organized by Indian Institute of Technology Kharagpur and HORIBA Scientific India, held from 11<sup>th</sup> to 12<sup>th</sup> November, 2021
- A five days AICTE Training and Learning (ATAL) Academy online advanced Faculty Development Programme (FDP) on “**Fundamentals of Novel Materials**” organized by Department of Physics,

Tripura University, Tripura, held from 4<sup>th</sup> to 8<sup>th</sup> October, 2021

- A five days AICTE Training and Learning (ATAL) Academy online elementary Faculty Development Programme (FDP) on “**Fundamentals of Novel Materials**” organized by Department of Physics, Tripura University, Tripura, held from 24<sup>th</sup> to 28<sup>th</sup> August, 2021
- A two days online workshop on “**Scanning Electron Microscopy: Technique and its Applications**” organized by North East Centre for Biological Sciences and Healthcare Engineering (NECBH), Indian Institute of Technology Guwahati (IITG), Assam, held from 29<sup>th</sup> to 30<sup>th</sup> July, 2021
- A three days online live national webinar on “**Research Approach and Nano Material Applications**” organized by IQAC and PG Department of Physics, Annai College of Arts and Science, Tamil Nadu, India, held from 21<sup>th</sup> to 23<sup>th</sup> June, 2021
- A five days short term training program on “**Advanced Experimental Techniques**” organized under the TEQIP-III project of D.U.I.E.T, Dibrugarh University, held from 28<sup>th</sup> May to 1<sup>st</sup> June, 2019

#### Referees List:

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#### Declaration:

I hereby declare that the information furnished above is true to the best of my knowledge.

**Date:** 05-11-2023

**Place:** Majuli

**Dibya Jyoti Borah**