

## Belal Usmani – Curriculum Vitae

Department of Physics  
Shibli National College, Azamgarh  
VBS Purvanchal University, Jaunpur  
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### RESEARCH INTERESTS

**Experimental:** Solar Thermal Energy (Solar Selective Absorber materials & Thin Films), Photovoltaic (Perovskite Solar Cells, Organic Solar Cells, Thin Film Solar Cells), Optoelectronics; Thin Film & Nanotechnology; Energy & Environment

**Theoretical:** Electronic Structure and Optical Properties of Materials for Energy & Optoelectronic Device Applications (Quantum Espresso Software)

### TEACHING & RESEARCH EXPERIENCES

- June 2018 to Present **Assistant Professor**, Department of Physics, Shibli National College Azamgarh, VBS Purvanchal University Jaunpur, (UP), India
- Sep 2017 - June 2018 **Project Scientist**, Electronics Materials Group, Department of Materials Science & Engineering, Indian Institute of Technology Kanpur, India
- Mar 2017 - Sept 2017 **Scientist C**, Department of Physics and Centre for Solar Energy, Indian Institute of Technology Jodhpur, India
- Jan 2010 – Jul 2010 **Trainee (M. Tech. Thesis Work)** Central Electronic Engineering Research Institute (CEERI), Pilani, India

### EDUCATION

- March 2017 **PhD**  
Department of Physics, Indian Institute of Technology Jodhpur, India  
• *Thesis Title:* Development of Spectrally Selective Absorber Materials and Coatings for Photothermal Applications.  
• *Advisors:* Dr. Ambesh Dixit, Dr. Vivek Vijay and Dr. Raul Chhibber
- 2008 - 2010 **M. Tech. (Master of Technology) in Nanotechnology**  
Department of Applied Physics, ZHCET, Aligarh Muslim University (AMU), Aligarh, India  
• *Thesis Title:* Block Copolymer Templated Syntheses & Organization of Metal Nanoparticles & Their Applications in Solar Cell.  
• *Advisors:* Prof. Afzal Ahmad (AMU) and Dr. Jamil Akhtar (Central Electronic Engineering Research Institute)  
• *Marks:* First Class (74.63%)
- 2005 - 2007 **M.Sc. (Master of Science) in Physics**  
Department of Physics,  
S. N. College, Azamgarh, VBS Purvanchal University Jaunpur, India  
• *Marks:* First Class (61.08%)
- 2002 - 2005 **B.Sc. (Bachelor of Science) in Physics & Mathematics**  
S. N. College, Azamgarh, VBS Purvanchal University Jaunpur, India  
• *Marks:* First Class (62.94%)

## TECHNICAL SKILL OF INSTRUMENTS AND SOFTWARE SKILLS

### *Technical Skill of Instruments (Hands on Operating Experience)*

- Powder X-Ray Diffraction (XRD) (D8 Advance, Bruker)
- Scanning Electron Microscope (SEM) (Carl Zeiss EVO 18 Special Edition)
- Energy-Dispersive X-ray Spectroscopy (EDS) (Oxford Instruments)
- Combined RF/DC Sputtering Unit (Hind High Vacuum)
- Atomic Force Microscopes (AFM) (Park Systems XE-70)
- Raman Microscope (BaySpec, Inc. Namadic™ multi-wavelength)
- UV-Vis/UV-Vis-NIR Spectrophotometer (Agilent Varian Cary 4000/5000 and PerkinElmer 900)
- VERTEX 70v Vacuum FT-IR Spectrometer with PMA 50 (Bruker)
- Fluorescence Spectrophotometer (LS 55 PerkinElmer)
- Electrochemical Workstation (Iviumstat/AUTOLAB)
- Spin Coater (Laurell Technologies)
- Simultaneous Thermal Analyzer (STA 6000 Perkin – Elmer)
- Differential Scanning Calorimetry (DSC 4000 Perkin – Elmer)
- Glove box (MBARUN UNILab/JACOMEX)
- Thermal Evaporator
- Oriel IQE-200

### *Software Skills*

Operating System: Windows, Linux

Software Packages: MS Office, Openoffice, CorelDRAW, etc

Programming Languages: C, MATLAB, SCILAB

## AWARDS AND FELLOWSHIPS

- National Post Doctoral Fellowship (N-PDF), January 2019, SERB, India
- Travel grant (#SB/ITS/00460/2013-2014), to participate in 223<sup>rd</sup> Electrochemical Chemical Society (ECS), Meeting, Canada, 2013, Department of Science and Technology (DST), India
- Travel grant (#TG/7609/12-HRD), to participate in 223<sup>rd</sup> Electrochemical Chemical Society (ECS), Meeting, Canada, 2013, Council of Scientific & Industrial Research (CSIR), India
- Ph.D. Fellowship, 2011-2014, Ministry of Human Resource Development (MHRD), India
- M. Tech Fellowship, 2008-2010, Department of Science and Technology (DST), India

## DIPLOMA AND CERTIFICATE COURSES

- Diploma in Computer Applications and Multilingual D.T.P. (DCA & MDTP), Shibli Inter College Azamgarh, DOEACC Centre, Chandigarh, India, 2006
- Diploma in Urdu Language, Shibli Inter College Azamgarh, National Council for Promotion of Urdu Language, MHRD, Government of India, 2006
- Certificate of Proficiency in Arabic Language, Aligarh Muslim University, Aligarh, India, 2009

## RESEARCH GUIDANCE

### **Doctoral Students:**

**01.** A Theoretical Study of Inorganic Halide Perovskite Absorbers for Solar Cell Application  
(In Progress)

**Master Students:** More than 15 master dissertation thesis

## TEACHING

### **Courses Taught:**

**UG Level:** 1. Principle of Electronics, 2. Electromagnetics

**PG Level:** 1. Quantum Mechanics, 2. Solid State Physics, 3. Digital Electronics

## PATENTS

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- [1] Indian Patent (filed)
- Title: A Black Chromium Coating Bath
  - Appl. No. : 1433/DEL/2013
- [2] US Patent (filed)
- Title: Ink Composition
  - Pub. No. : US 2014/036917 A1

## PUBLICATIONS

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### *International Journal*

- [12] **B. Usmani**, R. Ranjan, Parteek, S. K. Gupta, K. S. Nalwa, R. Gupta, and A. Garg, “Inverted PTB7-Th:PC71BM Organic Solar Cells with 11.8% PCE via Incorporation of Gold Nanoparticles in ZnO Electron Transport Layer”, *Solar Energy* 214 (2021) 220-230. [Elsevier. Impact factor 7.188]
- [11] Rahul Ranjan, **Belal Usmani**, Sowjanya Pali, Sudhir Ranjan, Anand Singh, Ashish Garg and Raju Kumar Gupta, “Role of PC60BM in Passivation and Improving Degradation Behavior in Regular Planar Perovskite Solar Cell”, *Solar Energy Materials & Solar Cells* 207 (2020) 110335. [Elsevier. Impact Factor 7.305]
- [10] Rahul Ranjan, **Belal Usmani**, Sudhir Ranjan, Hasitha C Weerasinghe, Anand Singh, Ashish Garg and Raju Kumar Gupta, “Enhanced Efficiency and Thermal Stability of Mesoscopic Perovskite Solar Cells by Adding PC70BM Acceptor”, *Solar Energy Materials & Solar Cells* 202 (2019) 110130. [Elsevier. Impact Factor 7.305]
- [9] Rajesh Kumar, **B. Usmani**, A. Dixit, “W/SS thin film as high temperature infrared reflector for solar thermal applications: Intrinsic properties and impact of residual oxygen”, *Mater. Res. Express* 6 106408, 2019. [IOPScience. Impact factor 2.025]
- [8] M. Sindhuja, V. Sudha, S. Harinipriya, R. Venugopal, **B. Usmani**, Electrodeposited Ni/SiC composite coating on graphite for high temperature solar thermal applications, *Materials Science for Energy Technologies* 1 (2018) 3–10.
- [7] **B. Usmani**, V. Vijay, R. Chhibber, A. Dixit, “Optimization of sputtered zirconium films infrared reflector in spectrally selective solar absorbers”, *Thin Solid Films*, Vol. 672, (2017), 17-25. [Elsevier. Impact factor 2.358]
- [6] **B. Usmani**, V. Vijay, R. Chhibber, A. Dixit, “Investigation of ZrO<sub>x</sub>/ZrC-ZrN/Zr thin film structural evolution and their degradation using X-ray diffraction and Raman spectrometry”, *Applied Physics A* (2016) 122:992. [Springer. Impact factor 2.983]
- [5] S. Harinipriya and **Belal Usmani**, “Structural and Optical behavior of electrodeposited black chrome-graphite encapsulated FeCo nanoparticles composite coatings”, *International Journal of Energy Research* (2016) doi: 10.1002/er.3669. [John Wiley. Impact factor 4.672]
- [4] **B. Usmani**, A. Dixit, “Impact of corrosion on microstructure and mechanical properties of ZrO<sub>x</sub>/ZrC-ZrN/Zr absorber-reflector tandem solar selective structures”, *Solar Energy Materials & Solar Cells*, Vol. 157, (2016), 733-741. [Elsevier. Impact Factor 7.305]
- [3] **B. Usmani**, A. Dixit, “Spectrally selective response of ZrO<sub>x</sub>/ZrC-ZrN/Zr absorber-reflector tandem structures on stainless steel and copper substrates for high temperature solar thermal applications”, *Solar Energy*, Vol. 134 (2016), 353-365. [Elsevier. Impact factor 7.188]

- [2] S. Manda, A. Saini, S. Khaleeq, R. Patel, **B. Usmani**, S. Harinipriya, B. Pratiher, B. Roy. "Thermocells of carbon material electrodes and its performance characteristics", *Journal of Materials Research and Technology*, 2(2), (2013), pp. 165–181.[Elsevier. Impact Factor 6.267]
- [1] **B. Usmani** and S. Harinipriya, Characterization of black chrome films in the presence and absence of graphite encapsulated FeCo nanoparticles prepared by electrodeposition technique for solar thermal applications, *ECS Transactions*, 53 (19), (2013), pp. 47-61.

#### *Conference with Proceeding*

- [6] **B. Usmani**, V. Vijay, R. Chhibber, A. Dixit, "Effect of Growth Condition on Mechanical Properties of Zirconium-Carbonitride Absorber Based Spectrally Selective Coatings", *Concentrated Solar Thermal Energy Technologies*, pp 137-143, *Springer Proceedings in Energy*, [https://doi.org/10.1007/978-981-10-4576-9\\_13](https://doi.org/10.1007/978-981-10-4576-9_13).
- [5] Rajesh Kumar, Ajoy K. Saha, **Belal Usmani** and Ambesh Dixit, "Optimization and structure-property correlation of black chrome solar selective coating on Copper and Nickel plated copper substrates, *Materials Today Proceedings* 01/2018; 5(11):23423-23427. <https://doi.org/10.1016/j.matpr.2018.11.082>.
- [4] A. K. Saha, R. Kumar, **B. Usmani**, L. Chandra and A. Dixit, "Development of Fe<sub>3</sub>O<sub>4</sub> Based Black Iron Solar Selective Coatings for Solar Absorber Applications", *Advanced Materials Proceedings*, Vol. 1(2), (2016), pp. 140-145.
- [3] **B. Usmani**, V. Vijay, R. Chhibber, L. Chandra, A. Dixit, "Zirconium carbide-nitride composite matrix based solar absorber structures on glass and aluminum substrates for solar thermal applications", *International Solar Energy Society (ISES) Procedia*, doi: 10.18086/swc.2015.04.02 Available at <http://Proceedings.ises.org>.
- [2] **B. Usmani**, S. Harinipriya, N. Kumar, V. Gupta, Solar Selective Coatings with Enhanced Thermal and Corrosion Stability: Electrochemically Deposited Black Chrome on Stainless Steel in the Presence of Graphite Encapsulated FeCo Nanoparticles, *Advanced Materials Research*, Vols. 875-877, (2014), pp. 388-393.
- [1] S. Harinipriya, **B. Usmani**, D. J. Rogers, V. E. Sandana, F. Hosseini Teherani, A. Lusson, P. Bove, H.-J. Drouhin and M. Razeghi, "ZnO Nanorod Electrodes for Hydrogen Evolution & Storage", *Proc. of SPIE*, Vol. 8263 82631Y-1, 2012

#### *Conference without Proceeding*

- [2] Rajesh Kumar, **Belal Usmani** and Ambesh Dixit, "Tungsten as a High-Temperature Infrared Reflector in Spectrally Selective Coatings: Issues & Challenges", 54<sup>th</sup> National Metallurgists' Day and 70<sup>th</sup> Annual Technical Meeting, November 11-14, 2016, Indian Institute of Technology, Kanpur, India
- [1] **B. Usmani**, V. Vijay, R. Chhibber, A. Dixit, "Microstructural degradation of FeCo(C) NPs modified black chrome spectrally selective composite coatings in 3.5% NaCl Corrosion environment", 4<sup>th</sup> Nano Today conference, Dubai, December 2015

#### *Book Chapter*

- [3] **B. Usmani**, V. Vijay, R. Chhibber, A. Dixit, "Solar Performance Analysis of ZrO<sub>x</sub>/ZrC-ZrN/Zr/SS Spectrally Selective Coating under Extreme Thermal Environment" M. Muruganant et al. (eds.), *Frontiers in Materials Processing, Applications, Research and Technology*, [https://doi.org/10.1007/978-981-10-4819-7\\_17](https://doi.org/10.1007/978-981-10-4819-7_17).

- [2] **B. Usmani** and S. Harinipriya, “High-Temperature Solar Selective Coating”, **Springer India 2015**, V. Vijay et al. (eds.), *Systems Thinking Approach for Social Problems, Lecture Notes in Electrical Engineering 327*, DOI 10.1007/978-81-322-2141-8\_15.
- [1] Anurag, P. Kapoor, **B. Usmani** and S. Harinipriya, “Performance Analysis of IOCL Rawara Photovoltaic Plant and Interpretation”, **Springer India 2015**, V. Vijay et al. (eds.), *Systems Thinking Approach for Social Problems, Lecture Notes in Electrical Engineering 327*, DOI 10.1007/978-81-322-2141-8\_16.

## PROFESSIONAL MEMBERSHIPS

- International Solar Energy Society (ISES)
- Electrochemical Society (ECS)

## ADMINISTRATIVE DUTIES

- Member of Subject Counseling Committee (NEP), Shibli National College Azamgarh, India, 2021
- Member of Proctorial Board, Shibli National College, Azamgarh, 2021-22
- President of Athletics Club of Sports Council, Shibli National College, Azamgarh, 2021-21
- Subject Expert, Academic Selection Committee, VBS Purvanchal University Jaunpur, 2021&22
- Lab In-Charge, M. Sc. (Final) Physics Lab, Department of Physics, SNC, Azamgarh
- Lab Co-In-Charge, B. Sc. II Year Physics Lab, Department of Physics, SNC, Azamgarh
- Member of Admission Committee, Shibli National College, Azamgarh, India, 2019-20
- Team member of National Conference of STET, IIT Jodhpur, India, 2016
- Senator (Ph.D.) in the Student Council, IIT Jodhpur, 2013 – 14
- Member of Mess Management Committee, IIT Jodhpur, 2011-12
- Team member of National Workshop on Oxide Materials, AMU Aligarh, India, 2009

## CONFERENCE/WORKSHOP/ SHORT TERM COURSE ATTENDED

### *Conference*

- National Conference of Solar Thermal Energy Technologies, IIT Jodhpur, Feb. 26 – 28, 2016, India
- 4<sup>th</sup> Nano Today Conference, Dec. 6 – 10, 2015, Dubai, UAE
- International Conference on FiMPART’ 15, June 12 – 15, 2015, Hyderabad, India
- 37<sup>th</sup> National Systems Conference (NSC, 2013), IIT Jodhpur, Dec. 05 – 07, 2013, India
- 223<sup>rd</sup> Electrochemical Society Meeting (ECS), Toronto, May 12 – 16, 2013, Canada
- ICFMEME , Beijing, Dec. 20-21, 2012, China

### *Workshop*

- Workshop on MOOCs Development and Delivery Organized by UGC HRDC, AMU Aligarh, Feb. 05-11, 2021, India
- Workshop on Functional and Energy Materials, Manufacturing & Structures, organized by University of Hyderabad & Royal Academy of Engineering, United Kingdom, 2013, India
- Workshop on Quantum Biology, IIT Jodhpur, from Jan 25 Jan 2013 to 27 Jan 2013, India
- Workshop on Computational Materials Design & Engineering, IIT Jodhpur, 2013, India
- Workshop on System Science Complex Network & Application, IIT Jodhpur, 2012, India
- Workshop on Solar Radiation Resource Assessment and Modeling, ICASET, IIT Jodhpur, 2012,
- Workshop on Oxide Materials organized by Department of Applied Physics, ZHCET, AMU Aligarh and IUCA, New Delhi, May 12 – 13, 2009, India

### *Short Term Course*

- Concentrated Solar Thermal Power Technologies and Applications, IIT Jodhpur, 2016, India
- Design of Sub-systems for Concentrated Solar Power Technologies, organized by International Centre for Application of Solar Energy Technologies (ICASET), IIT Jodhpur, 2013, India
- Organic Electronics and Solar Cells, Samtel Centre for Display Technologies, IIT Kanpur, 2012

### FACULTY INDUCTION PROGRAMME (FIP)/REFRESHER COURSE (RC) ATTENDED

#### *Faculty Induction Programme (FIP)*

- FIP under PMMMNITT, MHRD, BHU Varanasi, Sept. 02 to Oct. 01 2019

#### *Refresher Course (RC)*

- RC in Environmental Science organized the UGC-HRDC, JMI New Delhi, Oct. 07-21, 2020

### PERSONAL DETAILS

Nationality	Indian
Date of Birth	4 <sup>th</sup> January, 1986
Marital Status	Married
Passport No. and Date of Expiry	V0245181 & 11/03/2030

I hereby affirm that the information given above is true to the best of my knowledge & belief.

*Belal Usmani*

BELAL USMANI