

CURRICULUM VITAE

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Indian Institute of Science Research and Education (IISER),
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Educational Qualification

Doctor of Philosophy (Ph. D)

Thesis Title : Hierarchical Nanostructures of ZnO, Ag-ZnO, CeO₂-ZnO and Bi₂S₃: Structural, Optical and Field Electron Emission Investigations.
Year : January 2013
University : Department of Physics, University of Pune, Pune.

Master of Science in Physics

Grade : 'A' (6.5 GPA out of 10)
Year : 2007
University : Department of Physics, University of Pune, Pune.

Bachelor of Science in Physics

Grade : First Class with Distinction (78.58%)
Year : 2004
College : R.B.N.B College, Shrirampur (University of Pune).

Research experience

9.04.2013- 04.01.2014 : **Research Associate** (advisor Dr. S. B. Ogale, NCL, Pune)
Project : Topological defects in Non-collinear multiferronics: A nanodomain approach to multifunctionality.
17.10.2007 to 13.08.2012 : **Research Fellow** (advisor Dr. B. B. Kale, C-MET, Pune)
Project : Q-semiconductor glass nanocomposites for optical and energy applications.

Teaching experience

06.01.2014 – Till Date : Assistant Professor in Physics
Nowrosjee Wadia College, Pune.

14.08.2012 to 6.04.2013

Assistant Professor in Physics
Chandmal Tarachand Bora College, Shirur, Pune.

Research Project

- Project title:** Design and fabrication of self-supported 2D materials based heterostructures for high current density field emitter and photodetector application
Research grant: Science and Engineering Research Board for funding under Teachers Associateship for Research Excellence (TARE).
Mentor: Dr. Angshuman Nag, Associate Professor, IISER, Pune.
Duration: 3 yrs 3months (1/12/2020 to 29/02/2024)
Project cost: Rs. 18.30 lakhs
Status: Completed
- Project title:** Design Inorganic Semiconductor-based Heterostructures for Enhance Field Emission behavior
Research grant: B.C.U.D., S.P. Pune University, Pune
Duration: 2 yrs (2016-2018)
Project cost: Rs. 2.30 lakhs
Status: Completed.

Research Supervision :

PhD students : 4 Nos (registered)

M.Sc Students: 16 Nos

International Publications

- Hierarchical nanostructured ZnO with nanorods engendered to nanopencils and pin-cushion cactus with its field emission study; **S. S. Warule**, N. S. Chaudhari, J. D. Ambekar, B. B. Kale and M. A. More, **ACS Appl. Mater. Interfaces**, **2011**, 3, 3454–3462. [I.F. **9.5**, Citations **49**]
- Organization of cubic CeO₂ nanoparticles on the edges of self assembled tapered ZnO nanorods *via* a template free one-pot synthesis: significant Cathodoluminescence and field emission properties; **S. S. Warule**, N. S. Chaudhari, B. B. Kale, K. R. Patil, P. M. Koinkar, M. A. More and R. Murakami, **Journal of Materials Chemistry**, **2012**, 22, 8887. [I.F. **9.5**, Citations **72**]
- Architected Bi₂S₃ nanoflowers: Photo-enhanced field emission study; **S. S. Warule**, R. V. Kashid, D. R. Shinde, N. S. Chaudhari, B. B. Kale and M. A. More, **J. Nanoparticle Research**, **2012**, 14, 889. [I.F. **2.6**, Citations **18**]

4. Controlled synthesis aligned Bi₂S₃ nanowires, sharp apex nanowires and nanobelts with its morphology dependent field emission investigations; S. S. Warule, N. S. Chaudhari, B. B. Kale, S. Pandiraj and M. A. More, **CrystEngComm**, 2013, 15, 890. [I.F. 3.756, Citations 89]
5. Single step hydrothermal approach for devising hierarchical Ag-ZnO heterostructures with significant enhancement in field emission performance; S. S. Warule, N. S. Chaudhari, R. T. Khare, J. D. Ambekar, B. B. Kale and M. A. More, **CrystEngComm**, 2013, 15, 7475-7485. [I.F. 3.756, Citations 35]
6. Novel sonochemical assisted hydrothermal approach towards the controllable synthesis of ZnO nanorods, nanocups and nanoneedles and their photocatalytic study; S. S. Warule, N. S. Chaudhari, B. B. Kale and M. A. More, **CrystEngComm**, 2009, 11, 2776–2783. [I.F. 3.756, Citations 89]
7. Ecofriendly hydrogen production from abundant hydrogen sulfide using solar light-driven hierarchical nanostructured ZnIn₂S₄ photocatalyst; N. S. Chaudhari, A. P. Bhirud, R. S. Sonawane, L. K. Nikam, S. S. Warule, V. H. Rane and B. B. Kale, **Green Chemistry**, 2011, 13, 2500-2506. [I.F. 9.2, Citations 184]
8. Maghemite (hematite) core (shell) Fe₂O₃ nanorods *via* thermolysis of a molecular solid of Fe-complex; N. S. Chaudhari, S. S. Warule, S. Muduli, B. B. Kale, S. Jouen, B. Lefez, B. Hannoyer and S. B. Ogale, **Dalton Transactions**, 2011, 40, 8003-8011. [I.F. 3.5, Citations 66]
9. From small aromatic molecules to functional nanostructured carbon by pulsed laser-induced photochemical stitching; R. R. Gokhale, V. P. Thakare, S. S. Warule, B. Lefez, B. Hannoyer, J. P. Jog and S. B. Ogale, **AIP Advances**, 2012, 2, 022130. [I.F. 1.4, Citations 12]
10. Carbon nanoscrolls by pyrolysis of a polymer; P. Yadav, S. Warule, J. Joag and S. Ogale; **Solid State Comm.**, 2012, 152, 2092-2095. [I.F. 2.4, Citations 11]
11. Quantum dot CdS coupled Cd₂SnO₄ photoanode with high photoelectrochemical water splitting efficiency; S. Phadke, C. Ballal, A. Vaidya, S. S. Warule and S. B. Ogale, **J. Materials Chemistry A**, 2013, 1, 12426. [I.F. 9.5, Citations 25]
12. Nanostructured N-doped TiO₂ marigold flowers for an efficient solar hydrogen production from H₂S; N. S. Chaudhari, S. S. Warule, S. A. Dhanmane, M. V. Kulkarni, M. Valant and B. B. Kale, **Nanoscale**, 2013, 5, 9383. [I.F. 5.1, Citations 69]

13. A hollow nanogold/meso-magnetite composite: Pulsed laser synthesis, properties and biosensing application; N. S. Chaudhari, **S. S. Warule**, V. Thakare, S. Jouen, B. Hannyer, B. B. Kale and S. B. Ogale, **J. Nanoparticle Research**, **2013**, 15, 2081. [I.F. **2.6**]
14. Self assembled ZnIn₂S₄ rose and hollow marigold flower like nanostructures for solar hydrogen production; N. S. Chaudhari, **S. S. Warule** and B. B. Kale; **RSC Advances**, **2014**, 24, 12182-12187. [I.F. **4.6**, Citations **50**]
15. Vapor-Liquid-Solid growth of one-dimensional tin sulfide (SnS) nanostructures with promising field emission behavior; S. R. Suryawanshi, **S. S. Warule**, S. S. Patil, K. R. Patil and M. A. More, **ACS Appl. Mater. Interfaces**, **2014**, 17, 140-148. [I.F. **9.5**, Citations **88**]
16. Quantum dots conjugated zinc oxide nanosheets: Impeder of microbial growth and biofilm; R. Patil, H Gholap, **S. Warule**, A. Banpurkar, G. Kulkarni and W. Gade, **App. Surf. Sci.**, **2014**, 326, 73-81. [I.F. **6.9**, Citations **5**]
17. Photo-enhanced field emission characteristics of SnS₂ nanosheets; S. R. Suryawanshi, **S. S. Warule**, N. S. Chaudhari, S. B. Ogale and M. A. More, **AIP Solid State Physics: Conf. Proc.**, **2014**, 1591, 342-344.[Citations **8**]
18. Decoration of CdS nanoparticles on 3D self-assembled ZnO nanorods: a single-step **process** with enhanced field emission behavior; **S. S. Warule**,* N. S. Chaudhari, R. T. Shisode, K. V. Desa, B. B. Kale and M. A. More; **CrystEngComm**, **2015**, 17, 140-148. [I.F. **3.756**, Citations **36**]
19. The Fowler-Nordheim behavior and mechanism of photo-sensitive field from SnS₂ nanosheets; S. R. Suryawanshi, N. S. Chaudhari, **S. S. Warule** and M. A. More, **AIP Conf. Proc.** **2015**, 1665, 050177.
20. Dramatic enhancement in photoresponse of β -In₂S₃ through suppression of dark conductivity by synthetic control of defect induced carrier compensation; N. Chaudhari, L. Mandal, O. Game, **S. Warule**, D. Phase, S. Jadkar and S. Ogale, **ACS Appl. Mater. Interfaces**, **2015**, 7, 17671–176812015. [I.F. **10.383**, Citations **28**]
21. Hierarchical Nanostructures of Au@ZnO: Antibacterial and Antibiofilm Agent; R. Patil, **S. Warule**, G. Kulkarni, A. Banpurkar and H. Gholap, **Appl. Microbio. Biotechno.**, **2016**, 20, 5849-5858. [I.F. **5.56**, Citations **29**]
22. Field emission behaviour of manganese oxide nanorods synthesized by hydrothermal method; P. K. Bankar, D. S. Gavhane, P. S. Kolhe, **S. S. Warule** and M. A. More, **AIP Conf. Proc.** **2016**, 1731, 120030.
23. Nanostructured BiOI-GO composite: Facile room temperature synthesis with Enhanced multifunctionality as Field emission and Photocatalytic activity; P. K. Bankar, **S. S.**

- Warule, S. R. Jadkar, N. S. Chaudhari and M. A. More, **RSC Adv.**, 2016, 6, 83084. [I.F. 4.036, Citations 18]
24. Spatially branched CdS-Bi₂S₃ heteroarchitecture: Single step hydrothermal synthesis approach with Enhanced field emission performance and highly responsive broadband photodetection; P. K. Bankar, M. Pawar, A. Pavbake, S. S. Warule, D. J. Late and M. A. More, **RSC Adv.**, 2016, 6, 95092. [I.F. 4.036, Citations 13]
 25. Enhanced field emission behaviour from ethylene glycol mediated synthesis of 2D hexagonal SnS₂ disc with nanoparticle decoration; P. R. Mutadak, N. S. Chaudhari, D. C. Gadhave, P. K. Rajput, S. K. Kolekar, D. J. Late, M. A. More and S. S. Warule,* **Materials Science and Engineering: B**, 2022, 284, 115865. [I.F. 3.6, Citation 1]
 26. Nitrogen doped reduced graphene oxide: Investigations on electronic properties using Xray and Ultra-violet photoelectron spectroscopy and field electron emission behaviour; P. R. Mutadak, S. S. Warule, P. S. Kolhe, P. K. Bankar and M. A. More, **Surfaces and Interfaces**, 2023, 41, 103251. [I.F. 6.2, Citation 1]
 27. Hydrothermally synthesized MnCo₂O₄ nanoparticles for advanced energy storage applications; P. S. Auti, M. A. Yewale, R. A. Kadam, R. K. Mishra, U. T. Nakate, A. M. Teli, A. A. Jadhavar, V. Kumar, S. S. Warule* and D. K. Shin, **Materials Science and Engineering: B**, 2024, 301, 117198. [I.F. 3.6]
 28. Surface modification of a biomass-derived self-supported carbon nano network as an emerging platform for advanced field emitter devices and supercapacitor applications; P. Mutadak, A. Vedpathak, S. Warule*, N. Chaudhari, S. Sartale, M. More and D. J. Late, **Nanoscale Horiz.**, 2024, 9, 2259-2272. [I.F. 8]
 29. Controlled growth of CuO nanowires on Cu grid via thermal oxidation process with enhanced field electron emission properties; S. S. Gaikwad, S. S. Warule* and Mahendra A. More, **J of Materials Science: Materials in Electronics**, 2024, 35, 935. [I.F. 2.8]
 30. Layered sodium vanadate (NaV₈O₂₀) nanobelts: a new high-performing pseudocapacitive material for sodium-ion storage applications; A. S. Vedpathak, S. A. Sahu, T. N. Shinde, S. S. Kalyane, S. S. Warule, R. S. Kalubarme, A. Narayan Singh, R. N. Bulakhe, Ji Man Kim and S. D. Sartale*, **J. Mater. Chem. A**, 2025, 13(15), 10736-10748. [I.F. 10.7]
 31. Synergistic MoS₂@MWCNT nanocomposites for high-efficiency catalysis and energy applications; P.S. Auti, R.V. Kanawade, S.A. Alshehri, S.S. Warule,* D.K. Shin,* M.A. Yewale, **Chemical Physics Letters**, 2025, 879, 142417.
 32. Interface-Engineered Nickel Preinserted Vanadium Oxide (Ni_{0.22}V₂O₅) Nanobelts via Ultrasonic-Assisted Synthesis for High Performance Solid-State Supercapacitors; A.S.

Vedpathak, S. S. Kalyane, T. N. Shinde, D. Bansod, **S.S. Warule**, R. N. Bulakhe, C. Sonawane, P. Lokhande, Ji Man Kim, and S. D. Sartale*, **ACS Appl. Energy Mater.**, **2025**, 8 (18), 13539-13548.

- 33.** Facile Synthesis of Cu₂O-rGO Nanocomposite with Enhanced Electrochemical Performance as a Supercapacitor Electrode S. S. Gaikwad, **S. S. Warule***, M. D. Babar, S. K. Pardeshi, S. S. Dahiwalé and M. A. More, **Next Materials.**, **2026**, *10*, 101430.

Seminars / Conferences (selected)

International conferences: **13**

National conferences/workshops: **6**

Poster selected for **free participation** in “ICONSAT-2012” held at Hyderabad during 20-23rd Jan. 2012.

Experimental Skills

- **Hands on experience with Field Emission Scanning Electron Microscopy (FESEM)**
Four years experience on Hitachi S-4800 and FEI Nova SEM with operating skill of SE, EDAX, TED, STEM, GIS, and CL detector.
- **Hands on experience with Ultra High Vacuum Techniques**
- **Skilled with using Field Emission Microscope**
Studied field emission characteristics of various nanostructures/heterostructures in parallel plate geometry. Furthermore, the field emission investigation from single emitter as well multi-emitters on W-microtip.
- **Handling skilled with various synthesis techniques**
Chemical methods- Sonochemical, microwave, hydrothermal etc.
Physical methods- Thermal evaporation
- **Having practical knowledge of different characterization techniques**
SEM, TEM, EDAX (EDS), XRD, XPS, UV, PL, CL etc.

Teaching courses

Subject taught: Experimental Techniques in Physics [M.Sc.];

Classical Electrodynamics, Physics of Nanomaterials [T.Y.B.Sc.];

Mathematical Methods in Physics - I, Wave, Sound & Oscillations [S.Y.B.Sc.];

Nanomaterials-Synthesis and Characterization (S.Y.B.Sc. Minor (NEP1.0))

Mechanics and Properties of Matter [F.Y.B.Sc. (NEP1.0, NEP2.0)].

Extra-curricular activities

1. Serving as a peer reviewer to Nanoscale, RSC Advances, AIP Advances etc.
2. Served as resource person and lecture delivered during special workshop for “**Conventional Energy**” organized by B.C.U.D and Board of students Development, Poona College of Arts, Science and Commerce, Pune on 27th, February 2019.
3. Delivered invited lecture on '**Experimental Techniques in Physics-I**' at R.B.N.B. College, Shirampur
4. Delivered an invited guest lecture on '**Experimental Techniques in Physics-II**' at New Arts, Commerce & Science College, Shevgaon, Ahmednagar
5. Organising committee member in **2D Nano Mat-2021** (International Conference) organized by Centre for Nanoscience and Nanotechnology, AMITY University, Maharashtra, Department of Physics, SPPU, Pune and C-MET Pune from February 24-26th, 2021.
6. Delivered a lecture as a resource person for the PhD coursework program conducted by the Department of Physics at Nowrosjee Wadia College, Pune. (Oct-Nov 2024).
7. Signed a Memorandum of Understanding (**MoU**) with the **School of Mechanical Engineering, Yeungnam University, South Korea** to facilitate research collaboration and faculty-student exchange programs. (2024-2029)
8. Served as a **resource person**, delivering a lecture on '**Microstructural Analysis**' at the workshop 'Botany Beyond Borders: Basic and Applied Aspects of Plant Sciences', organized by the Department of Botany, Nowrosjee Wadia College, Pune, on March 7-8, 2025.
9. Short invited talk delivered on dated 29th March, 2025 at National conference on RIS 2025, Parner.

Awards / Prizes

1. Recipient of Late “**Dr. Ravikumar Bhalla Award**” to be given to the Best Research Student of Department of Physics, University of Pune, (2011).
2. “**Best Thesis Presentation**” award in Raman Memorial Conference 2012, held at Department of Physics, University of Pune, on 2-3rd March 2012.
3. Award of “**CSIR-Research Associate Fellowship**” (2014) at National Chemical Laboratory, Pune.
4. Award of “**CSIR-Nehru Postdoctoral Fellowship**” (2014) at National Chemical Laboratory, Pune.
5. Award of “**SERB-TARE Fellowship**” (2020-2024) at IISER, Pune.
6. “**Dr. M. V. Gokhale Felicitations**” prize for standing distinguished academic work in 2020-2021- MES’s Nowrosjee Wadia College, Pune.
7. Elected as a “**Young Associate of Maharashtra Academy of Sciences**” in the year **2023** for significant contributions in the field of Physical Sciences.

References

Dr. Bharat B. Kale

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