

BIODATA

1	Name	Dr. Bharat Bhanudas Kale, FRSC, UK
2	Date of Birth	01/06/1963
3	Current Position	Director, Research and Development, Pimpri Chinchwad University, Pune, Emeritus Scientist and Former Director General/Scientist-G of Centre for Materials for Electronics Technology (C-MET). Ministry of Electronics and Information Technology (Meity) Govt. of India, Pune -8, India. Advisors to SPEL, Pune, Munoth Industries, Tirupati.
4	Address 	Res: 12 Silvermoon Society Bavdhan Khurd, Pune 411021 Office; Pimpri Chinchwad University, Maval, Pune 412106 Centre for Materials For Electronics Technology (C-MET), Ministry of Electronics & Information Technology (MeitY), Panchawati, Off Pashan Road, Pune 411008. Mobile +91 9423014560
5	Email	bbkale1@gmail.com

Educational Qualification:

Sr. No	Degree/Certificate	Year of Passing	University /Institute	Subjects
1	B. Sc.	1984	University of Pune, Pune	Chemistry
2	M. Sc.	1986	University of Pune, Pune	Physical Chemistry
3	Ph. D	1992	CSIR-National Chemical Laboratory, Pune	Materials Reaction Engineering

Academic / Research Experience / Employment

S. No	From	To	Name Of Organization	Position Held
1	1986	1987	CSIR-National Chemical Laboratory, Pune	Research Assistant
2	1987	1991	CSIR-National Chemical Laboratory, Pune	JRF through sponsored project
3	18/01/91	1995	Centre For Materials For Electronics Technology (C-MET), Pune	Scientist - B
4	1995	1998	Centre For Materials For Electronics Technology (C-MET), Pune	Scientist - C
5	2003	2011	Centre For Materials For Electronics Technology (C-MET), Pune	Scientist - D
6	2003	2011	Centre For Materials For Electronics Technology (C-MET), Pune	Scientist – E (HOD- Nano Crystalline Materials)

7	2011	2018	Centre For Materials For Electronics Technology (C-MET), Pune	Scientist – F (Professor Grade)
8	2014	2016	Centre For Materials For Electronics Technology (C-MET), Pune	Additional Charge of Director
9	2016	2018	Centre For Materials For Electronics Technology (C-MET), Pune	Director
10	2018	Till date	Centre For Materials For Electronics Technology (C-MET), Pune	Scientist - G
11	2020	2021	Centre For Materials For Electronics Technology (C-MET)	Additional Charge of Director General
12	2021	2023	Centre For Materials For Electronics Technology (C-MET)	Director General
13	Sept 2023	15 th Sept	MITWPU, Univrrsity Kothrud Pune	Emeritus Prof and Director R and D and also dean R and D (additional charge)
14	10 th Nov 2025	Till date	Pipmri Chnicwad University , Pune (Parmamant)	Director, Research and Development (Sr. Prof Grade)
International Appointment				
S. No	From	To	Name Of Organization	Position Held
1.	1996	1997	University of Leeds, Leeds, UK Materials Science Engineering	Boyscast Fellow, DST
2.	2004	2005	Korea Research Institute of Chemical Technology, Daejon, KRICT, South Korea	Brain pool Scientist (Awarded by Brain Pool Fellowship)
3.	2011 (8 Days)	2012 (8 Days)	University of Nova Garcia, Garcia, Slovenia	Visiting fellow under collaboration
4.	2011	2011	Hitachi (15 days)	Training FESEM
5.	2012 (8 days)		Hitachi Japan	FESEM training
6.	2014	2015	Materials Department, Chonnam National University, Gwannju	Brainpool fellow Korea
7.	2013 (8 Days)	2018 (8 days)	Korea Research Institute of Chemical Technology, Daejon, KRICT, South Korea	Visiting fellow
8.	2016 (8 days)	2016	University College of London	Visiting fellow under collaboration
9.	2017 (8 days)	2017	University College of London	Visiting fellow under collaboration
10.	2018 (20 days)	2018	University of Leeds, Leeds, UK	The Royal Society of London Project
11.	2019 (8 days)	2019	Korea Research Institute of Chemical Technology, Daejon, KRICT, South Korea	Seminar on “Hydrogen production using nanostrutured glass

				photocatalyst”.
12.	2019 (July-August)	2019 (30 days)	University of Leeds, Leeds, UK	Project Co-Investigator

Area of Specialization:

Advanced functional materials, nanomaterials, nano-composites (Glass and polymer), organic semiconductors. Glass ceramics for the advanced applications for Photonic devices/Electronics, Optical Sensors, quantum materials, semiconductor, Lithium/Sodium ion battery as well air batteries, Supercapacitors, thermoelectric solar cells, Photocatalyst for solar hydrogen production/storage and Radiation based devices.

Summary of Biodata:

1	Name	Dr. Bharat Bhanudas Kale
2	Present position	Director, Research and Development , Pimpri Chinchwad Univerity, Pune, Emeritus Scientist and Former Director General/Scientist-G of Centre for Materials for Electronics Technogy (C-MET). Ministry of Electronics and Information Technology (Meity) Govt. of India, Pune -8, India
3	Qualifications	Master in Physical Chemistry, Pune University Ph. D in (Chemistry) Materials reaction Engineering (Advanced materials) in CSIR-National Chemical Laboratory, Pune, Chemical Engineering Division
4	Expertise (Research Experience)	34 years: Nanostructured advanced Materials, Photonic materials, Solar cells, Thermoelectric solar cells, Lithium ion, Lithium air Battery, Na-ion, Na-air Batteries, LiS/Na-s batteries, Hydrogen production from Semiconductors, Quantum dots in glasses, polymers, Nanocomposites, Chalcogenide materials and glasses. Magnetic materials, Super capacitor materials, Hydrogen storage materials, fuel cells materials etc.
5	Administrative Experience (Leadership)	Handled the research group of 20-30 people since 20 years. Responsibilities as a Director, C-MET, Pune lab since March 2014. Vast experience of PRSG review committee as a member, Purchase committee chairman, Selection committee member of C-MET, Pune University, Shivaji, Jalgaon, National Chemical laboratory ETC.
6	Google Scholar Research Index	h-index: 63 (Citations- 13000), i10 index : 223 (https://scholar.google.co.in/citations?user=pRskAv4AAAAJ&hl=en)
7	No. Publications In Int. Journals	More than 350 (Advanced functional Materials, Small, Nanoscale, J. Mat Chem, Chem com, Green Chem, Energy Environ Technology etc I.F. 4 to 12) Most of papers in RSC Journals
8	Patents	More than .. 32 (4 US applied 2 PCT granted)
9	No of Ph. D students	23 Awarded (13 awarded as a guide and 9 as co-guide). 9 Registered (4 as a guide and 5 as a co-guide)
10	Post graduate Students	06 completed (PPR) and 25 have done last year projects
11	No. of projects	[Total Budget: Rs. 20 Cr]: MeitY, DST, MNRE, BRNS, ISRO, etc

	completed	04 International Project: INDO-UK, INDO-SLOVENIA AND INDO-JAPAN
12	Projects in Hand	[Total Budget: Rs. 95 Cr]: MeitY, DST, DRDO, ISRO, etc
13	Foreign Collaboration	05 Collaborative Projects: INDO-Slovenia, INDO-JAPAN, INDO-UK, Indo-Korea, Royal Society, UK Other Collaborations: University of Leeds, UK, TN TECH University, USA, Utah University, USA,
14	Technology Transfer	3
15	No. of Inter. Confer. Organized	At C-MET : 5 At MIT: 2 (National Scientist Round Table conference (NSRTC) in the year 2024 and 2025).
16	Invited Talks	> 250
17	Awards	1. MRSI Distinguished Lecturship award 2025, MRSI, Bangalore 2. Prof.B.P Verma Memorial Award in Excellence in Nanomaterials and nano technology from Indian Chemical Society 2025 3. Prof. S.K Bhattacharya Award in Catalysis-by-Catalysis Society of India (cash award) 2025 4. Ranked in 2% world scientist List published by Stanford. (2023, 2024 and 2025) 5. Ranked in Best Material scientists in India (101) and globally 6747 (www.research.com) 6. MRSI-ICSC Materials Science Annual Prize Winners 2021 7. AICTE-INAE Distinguished Visiting Professor, Symbiosis Institute of Technology, Pune 8. VASVIK Industrial Research Award 2019 9. Fellow of Royal Society of Chemistry (FRSC), London 2020 10. Life Fellow, Indian Chemical Society, Kolkata, India 2020 11. APAM, Academician, (Asia Pacific Academy of Materials) 2019 12. Royal Society of Chemistry International collaboration 2017 proposal award with University of Leeds 13. Sr. Brainpool fellowship award South Korea 2014 (Selected in Top 10 Brain pool). 14. Award of the Year 2013 on Photocatalysis by KRICT, Daejeon South Korea 15. Editorial board member of Metals and Materials International – Springer. 16. MRSI Gold Medal Award 2010, Bangalore. 17. Secretary, Maharashtra Academy of Science (FMASc). 18. Fellow of Maharashtra Academy of Science (FMASc). 19. Chairman, MRSI (Pune Chapter). 20. Life Member of Materials Research Society of India (MRSI). 21. Brainpool fellowship award South Korea (2004). 22. Young Scientist Boysscast Fellowship Award (1996).

Book Chapters :

1. **B. B. Kale***, M. A. Mahadadalkar, A. P. Bhirud, *Book Chapter entitled “Glassy Photocatalysts: New Trend in Solar Photocatalysis”* in book *Visible Light-Active Photocatalysis: Nanostructured Catalyst Design, Mechanisms, and Applications*, **Wiley-VCH Verlag GmbH & Co. KGaA** Online ISBN: 9783527808175, **2018**.

2. Trupti Bhole, **B. B. Kale**, *Book Chapter entitled “Nanotechnology Applications in Medicinal Plants and their Bionanocomposites: An Ayurvedic Approach”* **Cambridge Scholars Publishing** Online ISBN: 1-0364-0228-2, ISBN13: 978-1-0364-0228-0, **2024**

Number of Research Publications: 350 h-index: 63 (citations 13000)

<https://scholar.google.co.in/citations?user=pRskAv4AAAAJ&hl=en>

List of Best Publications:

1. P. N. Birla, S. S. Arbuj, R. Chauhan, M. D. Shinde, S. B. Rane, S. W. Gosawi, **B. B. Kale*** Electroless Nickel Plated Nb₂O₅ via Autocatalytic Deposition, an Efficacious Platform for Photocatalytic Hydrogen Production via Water Splitting, **Int. J. Hydrogen Energy (IF 8.3) 2025**, 172, 151210.
2. M. A. Mahadadalkar, S. W. Gosavi, M. Koh, N. Park, K. H. Park, **B. B. Kale*** Fast Charge Carrier Dynamics Boosted Sustainable Green Hydrogen Production using CdIn₂S₄/g-C₃N₄ Photocatalyst, **Int. J. Hydrogen Energy (IF 8.3) 2025**, 140, 246–255.
3. A. B. Tambe, S. S. Arbuj, G. G. Umarji, S. K. Kulkarni, **B. B. Kale*** In Situ Synthesis of gC₃N₄/Ti₃C₂T_x Nano-Heterostructures for Enhanced Photocatalytic H₂ Generation via Water Splitting, **RSC Adv. (IF 4.036) 2023**, 13 (50), 35369–35378.
4. P. N. Birla, S. S. Arbuj, M. D. Shinde, S. Joseph, S. B. Rane, S. K. Kulkarni, **B. B. Kale*** Electroless Ni Plated Nanostructured TiO₂ as a Photocatalyst for Solar Hydrogen Production, **RSC Adv. (IF 4.036) 2023**, 13 (29), 20068–20080.
5. N. Jawale, S. Arbuj, G. Umarji, M. Shinde, **B. B. Kale**, S. Rane* Ni Loaded SnS₂ Hexagonal Nanosheets for Photocatalytic Hydrogen Generation via Water Splitting, **RSC Adv. (IF 4.036) 2023**, 13 (4), 2418–2426.
6. A. B. Tambe, S. S. Arbuj, G. G. Umarji, N. S. Jawale, S. B. Rane, S. K. Kulkarni, **B. B. Kale*** 2D Layered MXene/TiO₂ Nano-Heterostructures for Photocatalytic H₂ Generation, **Graphene & 2D Mater. (IF 6.2) 2023**, 7 (3), 91–106.
7. Y. A. Sethi, A. K. Kulkarni, A. A. Ambalkar, R. P. Panmand, M. V. Kulkarni*, Suresh W Gosavi, **Bharat B Kale** Efficient Solar Light-Driven Hydrogen Generation Using an Sn₃O₄ Nanoflake/Graphene Nanoheterostructure, **RSC Adv. (IF 4.036) 2021**, 11 (48), 29877–29886.
8. A.R. Gunjal, Y. A. Sethi, U. V. Kawade, R. P. Panmand, C. K. Ugale, J. D. Ambekar, Arvind V. Nagawade*, **Bharat B. Kale*** Unique Hierarchical SiO₂@ZnIn₂S₄ Marigold Flower-Like Nanoheterostructure for Solar Hydrogen Production, **RSC Adv. (IF 4.036) 2021**, 11 (24), 14399–14407.
9. S. R. Damkale, S. S. Arbuj, G. G. Umarji, S. B. Rane, **B. B. Kale*** Highly Crystalline Anatase TiO₂ Nanocuboids as an Efficient Photocatalyst for Hydrogen Generation, **RSC Adv. (IF 4.036) 2021**, 11 (13), 7587–7599.

10. Y. A. Sethi, A. K. Kulkarni, A. A. Ambalkar, S. K. Khore, A. R. Gunjal, S. W. Gosavi, **B. B. Kale*** CdS Decorated MnWO₄ Nanorod Nanoheterostructures: A New 0D–1D Hybrid System for Enhanced Photocatalytic Hydrogen Production under Natural Sunlight, **Nanoscale Adv. (IF 9.6) 2021**, 3 (2), 508–516.
11. M. S. Tamboli, S. A. Patil, A. M. Tamboli, S. S. Patil, N. T. N. Truong, K. Lee*, C. S. Praveen, N. K. Shrestha, Chinho Park *, **Bharat B. Kale*** Polyaniline-Wrapped MnMoO₄ as an Active Catalyst for Hydrogen Production by Electrochemical Water Splitting, **Dalton Trans. (IF 5.5) 2022**, 51 (15), 6027–6035.
12. S. Kumaravel, E. Kim, **B. B. Kale**, A. Adhikari, R. Patel, S. Kundu* Recent Developments in Conductive Polymer-Based Electro-/Photoelectrocatalytic Materials for Effective Hydrogen/Oxygen Evolution Reactions: A Review, **ChemElectroChem (IF 5.1) 2022**, 9 (19), e202200724.
13. S. S. More, R. B. Kale, P. J. Ambekar, N. D. Khupse, R. S. Kalubarme, M. V. Kulkarni, **B. B. Kale*** Imidazolium Functionalized Copolymer Supported Solvate Ionic Liquid Based Gel Polymer Electrolyte for Lithium- Ion Batteries, **ACS Appl. Polym. Mater. (IF 5.3) 2024**, 6 (19), 11953–11963.
14. S. C. Kanade, S. Mukhopadhyay, B. Nayak, M. Gautam, **B. B. Kale*** Dual Carbide Heterostructure Interface Mimicking Noble Metal-Like Activity for Reversible Dioxygen Catalysis in Rechargeable Air Batteries, **ACS Appl. Energy Mater. (IF 7.4) 2024**, 7 (19), 8536–8545.
15. R. S. Kate, H. S. Jadhav, U. P. Chothe, K. Bhattacharjee, M. V. Kulkarni, **B. B. Kale*** Critical Review of the Recent Progress and Challenges of Polyanion Na₃V₂(PO₄)₃ Cathode Materials in Sodium-Ion Batteries, **J. Mater. Chem. A (IF 13.7) 2024**, 12 (13), 7418–7451.
16. S. Kadam, R. Kate, U. Chothe, P. Chalwadi, J. Shingare, M. Kulkarni, **B. B. Kale*** Highly Stable MWCNT@NVP Composite as a Cathode Material for Na-Ion Batteries, **ACS Appl. Mater. Interfaces (IF 13.3) 2023**, 15 (29), 34651–34661.
17. M. Al-Murish, V. Autade, E. Kumi-Barimah, R. Panmand, **B. B. Kale**, A. Jha* Engineering of Solar Energy Harvesting Tb³⁺-Ion-Doped CdS Quantum Dot Glasses for Photodissociation of Hydrogen Sulfide, **ACS Appl. Energy Mater. (IF 7.4) 2023**, 6 (17), 8875–8888.
18. S. C. Kanade, A. A. Ambalkar, Y. A. Sethi, M. O. Thotiyl, **B. B. Kale**, A. B. Gambhire* A Nanostructured Mo₂C-rGO Heterostructure as a Stable Anode with Ultra-High Capacity for Lithium-Ion Battery, **ChemistrySelect (IF 3.6) 2022**, 7 (6), e202104252.
19. S. Kanade, M. Gautam, A. Ambalkar, Y. Sethi, M. O. Thotiyl, **B. B. Kale**, ... Multilayered Vanadium Carbide-Reduced Graphene Oxide (VC@rGO) Nanocomposite as an Ultrahigh-Capacity Anode Material for Li- and Na-Ion Batteries, **ACS Appl. Energy Mater. (IF 7.4) 2022**, 5 (2), 1972–1983.
20. M. A. Mahadadalkar, S. W. Gosavi, **B. B. Kale**, Interstitial charge transfer pathways in a TiO₂/CdIn₂S₄ heterojunction photocatalyst for direct conversion of sunlight into fuel, *J. Mater. Chem. A* **2018**, 6 (33), 16064-16073, (IF 10.773)

21. R. P. Panmand, P. Patil, Y. Sethi, S. R. Kadam, M. V. Kulkarni, S. W. Gosavi, N. R. Munirathnam, **B. B. Kale***, Unique perforated graphene derived from Bougainvillea flowers for high-power supercapacitors: a green approach *Nanoscale*, **2017**, 9, 4801-4809. (IF: 6.97)
22. T. C. Nirmale, I. Karbhal, R. S. Kalubarme, M. V. Shelke, A. J. Varma, and **B. B. Kale*** "Facile Synthesis of Unique Cellulose Triacetate Based Flexible and High Performance Gel Polymer Electrolyte for Lithium Ion Batteries." *ACS Appl. Mater. Interfaces*, **2017**, 9 (40), pp 34773–34782. (IF: 8.456)
23. S. S. Patil, D. R. Patil, S. K. Apte, M. V. Kulkarni, J. D. Ambekar, C. J. Park, S. W. Gosavi, S. S. Kolekar, **B. B. Kale***, Confinement of Ag_3PO_4 nanoparticles supported by surface plasmon resonance of Ag in glass: efficient nanoscale photocatalyst for solar H_2 production from waste H_2S *Applied Catalysis B: Environmental*, **2016**, 190, 75-84. (IF: 14.229)
24. S. S. Patil, D. P. Dubal, M. S. Tamboli, J. D. Ambekar, S. S. Kolekar, P. G. Romero, **B. B. Kale***, D. R. Patil, "Ag: BiVO_4 dendritic hybrid-architecture for high energy density symmetric supercapacitors" *J. Mater. Chem. A*, **2016**, 4, 7580-7584. (IF:10.77)
25. A. Bhirud, S. Sathaye, R. Waichal, J. D. Ambekar, C. J. Park, **B. B. Kale*** "In-situ preparation of N- TiO_2 /graphene nanocomposite and its enhanced photocatalytic hydrogen production by H_2S splitting under solar light " *Nanoscale*, **2015**, 7, 5023-5033 (IF:6.97).
26. V. U. Pandit, S. S. Arbuj, R. R. Hawaldar, P. V. Kshirsagar, U. P. Mulik, S. W. Gosavi, J. Park, **B. B. Kale*** In-situ Preparation of Novel Organo-Inorganic (6, 13-Pentacenequinone: TiO_2) coupled Semiconductor Nanosystem: A new Visible Light active Photocatalyst for Hydrogen Generation. *J. Mater. Chem. A*, **2015**, 3, 4338-4344. (IF:10.77)
27. A. Bhirud, S. Sathaye, R. Waichal, C. J. Park, **B. B. Kale*** "In situ preparation of N-ZnO/graphene nanocomposites: excellent candidate as a photocatalyst for enhanced solar hydrogen generation and high-performance supercapacitor electrode " *J. Mater. Chem. A*, **2015**, 3, 17050-17063 (IF 10.77)
28. S. R. Kadam, D. J. Late, R. P. Panmand, M. V. Kulkarni, L. K. Nikam, S. W. Gosavi, C. J. Park, **B. B. Kale*** Nanostructured 2D MoS_2 honeycomb and hierarchical 3D CdMoS_4 marigold nanoflowers for hydrogen production under solar light *J. Mater. Chem. A*, **2015**, 3, 21233-21243 (IF 10.77).
29. S. K. Apte, S. N. Garaje, S. D. Naik, R. P. Waichal, J. O. Baeg, **B. B. Kale***, Quantum confinement controlled solar hydrogen production from hydrogen sulfide using a highly stable $\text{CdS}_{0.5}\text{Se}_{0.5}/\text{CdSe}$ quantum dot–glass nanosystem, *Nanoscale*, **2014**, 6, 908-915 (IF 6.97)
30. N. S. Chaudhari, S. S. Warule, S. A. Dhanmane, M. V. Kulkarni, M. Valant, **B. B. Kale***, Nanostructured N-doped TiO_2 marigold flowers for an efficient solar hydrogen production from H_2S , *Nanoscale*, **2013**, 5, 9383-9390 (IF 6.97).
31. N. S. Chaudhari, S. S. Warule, S. A. Dhanmane, M. V. Kulkarni, M. Valant, **B. B. Kale*** Nanostructured N-doped TiO_2 marigold flowers for an efficient solar hydrogen production from H_2S , , *Nanoscale*, **2013**, 5, 9383-9390 (IF 6.97)

32. S. K. Apte, S. N. Garaje, S. D. Naik, R. P. Waichal, **B. B. Kale*** H₂S using size tuneable cubic bismuth (Bi⁰) quantum dots–GeO₂ glass photocatalyst under solar light, *Green Chem.*, **2013**, *15*, 3459-3467 (impact factor = 9.405)
33. S. A. Mahapure, P. K. Palei, L. K. Nikam, R. P. Panmand, J. D. Ambekar, S. K. Apte, **B. B. Kale***, Novel nanocrystalline zinc silver antimonate (ZnAg₃SbO₄): an efficient & ecofriendly visible light photocatalyst with enhanced hydrogen generation, *J. Mater. Chem. A*, **2013**, *1*, 12835-12840. (IF: 10.77)
34. S. K. Apte, S. N. Garaje, S. D. Naik, R. P. Waichal, **B. B. Kale***, Environmentally benign enhanced H₂ production from abundant copious waste H₂S using size tuneable cubic bismuth (Bi⁰) quantum dots–GeO₂ glass photocatalyst under solar light, *Green Chem.*, **2013**, *15*, 3459-3467 (IF 9.405)
35. R. S. Diggikar, M. V. Kulkarni, G. M. Kale, **B. B. Kale*** Formation of multifunctional nanocomposites with ultrathin layers of polyaniline (PANI) on silver vanadium oxide (SVO) nanospheres by in situ polymerization, *J Mater. Chem. A*, **2013**, *1*, 3992-4001 (IF 10.77)
36. S. K. Apte, S. N. Garaje, M. Valant, **B. B. Kale*** Eco-friendly solar light driven hydrogen production from copious waste H₂S and organic dye degradation by stable and efficient orthorhombic CdS quantum dots–GeO₂ glass photocatalyst, *Green Chem.*, **2012**, *14*, 1455-1462 (IF 9.405)
37. A. P. Bhirud, S. D. Sathaye, R. P. Waichal, L. K. Nikam, **B. B. Kale***, An eco-friendly, highly stable and efficient nanostructured p-type N-doped ZnO photocatalyst for environmentally benign solar hydrogen production, *Green Chem.*, **2012**, *14*, 2790-2798 (IF 9.405).
38. N. S. Chaudhari, A. P. Bhirud, R. S. Sonawane, L. K. Nikam, S. S. Warule, V. H. Rane, **B. B. Kale***, Ecofriendly hydrogen production from abundant hydrogen sulfide using solar light-driven hierarchical nanostructured ZnIn₂S₄ photocatalyst, *Green Chem*, **2011**, *13*, 2500-2506. (IF 9.405)
39. S. K. Apte, S. N. Garaje, G. P. Mane, A. Vinu, S. D. Naik, D. P. Amalnerkar, **B. B. Kale***, A Facile Template-Free Approach for the Large-Scale Solid-Phase Synthesis of CdS Nanostructures and Their Excellent Photocatalytic Performance, *Small*, **2011**, *7*, 957-964. (Impact Factor = 8.6).
40. C. B. Park, S. H. Lee, E. Subramanian, **B. B. Kale***, S. M. Lee, J. O. Baeg, Solar energy in production of L-glutamate through visible light active photocatalyst—redox enzyme coupled bioreactor, *Chem. Commun*, **2008**, 5423–5425. (Impact Factor = 6.37)
41. T. C. Jagadale, S. P. Takale, R. S. Sonawane, H. M. Joshi, S. I. Patil, **B. B. Kale***, S. B. Ogale, N:TiO₂ nanoparticle based visible light photo-catalyst by modified peroxide sol-gel method, *J. Physical Chem. C* **2008**, *112*, 14595-14802. (IF 4.8)
42. **B. B. Kale**, J. O. Baeg, S. M. Lee, H. Chang, S. J. Moon, C. W. Lee, CdIn₂S₄ Nanotubes and “Marigold” Nanostructures: A Visible-Light Photocatalyst, *Advanced Functional Materials* (IF = 15.621), **2006**, *16*, 1349-1354.

Brief Experience:

PhD at CSIR-National Chemical Laboratory, Pune

The Research work is concerned with the experimental studies on high temperature gas-solid and solid-solid reactions (proceeding through gaseous intermediates) for **preparation of Multifunctional Advanced Materials**. The reaction of this type involves coupling of two gas-solid reactions in which one of them is the rate controlling reaction. (1) Synthesis of cheaper **Barium carbonate for ferrite** using barite ore via gas solid reactions: **The 5 kg batch level reactor has been designed and developed and patented. The further consultancy was given to Kores India Ltd. Cuddapa.** (2) Cheap **Iron oxide (Hematite)) synthesis for ferrite** from Iron ore using gas – solid reactions. To increase the efficiency novel and cheaper catalyst in reduction process have been developed. (3) **The pure Iron oxide (Hematite)** has also been synthesized using pyrite ore using solid –solid and gas solid reaction approach. (4) The novel advanced material i.e. **Calcium cyanamide (CaCN₂)** has been developed for JK industries. It is used in **nitrogen doping in steel and other metals/alloys required for highly specific applications**. Kinetic models have been used for all reactions. **The calcium cyanamide process has been demonstrated on 5kg batch level.** Studies on gas solid reactions involving structural changes were also carried out by using modern techniques such X-ray diffractions, Thermogravimetry and Mercury Porosimetry etc. Using this system gasification of carbon in carbon dioxide, decomposition reactions, carbon dioxide and Sulphur dioxide capture reactions with CaO were also studied. **(Energy Storage)**

Other Research work along with Ph.D work (1986-88)

- (1) Ethanol Project sponsored by UNDP (Continuous Fermentation process). At National Chemical Laboratory, Pune: The research activities included (I) Ethanol from molasses by continuous fermentation process. (ii) Ethanol from molasses using baker yeast by matrix immobilization methods (Continuous process), (iii) Ethanol from molasses by Using baker yeast (Batch process), (iv) Ethanol from molasses by using flocculent yeast (continuous process), (v) Yeast growth (Flocculent type) techniques. **Worked as a team member and demonstration of TOT was given to All Sugar factories.** (Sponsored project) **Total cost of the project was around 100 Lakhs.**
- (2) Ethylene Oxide project sponsored by Engineers India Ltd. New Delhi, India. At National Chemical Laboratory, Pune **(1988- 90)**, : The research activities included: **Novel advanced reduction Catalyst Ni doped alumina, Ni impregnated Zeolites preparation and testing on Berty Reactor.** (i) Preparation of Ethylene gas by oxidation of Ethanol (ii) Ethylene Oxide preparation by oxidation of ethylene gas in a single type pilot reactor. The pilot plant has been set up and ethylene oxide has been prepared by using different catalysts. (iii) **The Project cost was 110 lakhs and worked as a team member. Deeply involved in reactor system design and development.**

Table.1 Research Experience from 1991-Till Date

Sr. No.	Funding agency	Name of project	Duration of Project	Grant Amt (Lakhs)
1	MeitY-NPC, New Delhi	Development of optical fiber grade SiCl ₄	1992-1995	16.74

2	MeitY-EMDC, New Delhi	Development of electronic grade BaCO ₃ /SrCO ₃	1992-1995	17.44
3	MNRE, New Delhi	Development of cathode materials for lithium rechargeable batteries	1999-2003	16.00
4	ISRO	Development of optical cut off filters	2000-2002	10.00
5	DST, New Delhi	Growth of CdS/Se wide band gap semiconductor in glass matrix	2004-2007	10.00
6	BRNS, Mumbai	TiO ₂ –Phosphate Glass Nanocomposite for Nonlinear Optical Application	2004-2007	16.41
7	EMDC, MeitY, New Delhi	Development of Lead-Free X-ray Absorbing Materials	2007-2010	112.00
8	ISRO, Bangalore	Development of nanostructured binary spinel sulphide for hydrogen generation using solar energy	2007-2009	10.21
9	DST, New Delhi	Development of solar light driven nanostructured ZnIn ₂ S ₄ photocatalyst for hydrogen generation	2009-2012	20.00
10	MNRE, New Delhi	Development of nanostructured semiconductor chalcogenide spinels visible light photocatalyst for hydrogen generation	2009-2012	22.40
11	MeitY under Nano-initiative Program, MeitY, New Delhi	Q-semiconductor-glass nanocomposites for optical and energy (using solar light) applications.	2010-2014	451.00
12	MeitY, New Delhi	Development of Prototypes Aprons, Glass Sheets and Curtains from Lead free X-Ray absorbing Materials	2011-2014	112.58
13	MeitY, New Delhi	Development of Optical isolators Using Quantum Dots based Photonic Glasses	2012-2015	156.08
14	ISRO, Bangalore	Development of stable Pt and Ni doped nanostructured ternary semiconductor catalysts for solar hydrogen production by water splitting.	2012-2014	10.98
15	MNRE, New Delhi	Development of the prototype photoreactor for the hydrogen production from H ₂ S under natural sunlight	2014-2017	23.90
16	DST, New Delhi	Novel solar light driven Bismuth sulfide quantum dot–glass nanocomposite photocatalyst for hydrogen generation	2014-2017	27.00
17	MeitY, New Delhi	WS ₂ -glass nanocomposite for gamma shielding.	2014-2015	53.00
18	MeitY, New Delhi	Development of active materials (cathode and anode) and electrolytes for high energy density lithium-ion cell/ battery with fabrication of prototype cell.	2013-2016	498.00
19	BRNS, Mumbai	Development of Nanostructured PdTe powder for Thermoelectric Application.	2014-2016	18.00
20	DRDO, New Delhi	Development of visible light Active Titanium oxynitride and Titanumoxynitride Photo catalysts for H ₂ O	2014-2017	44.00
21	MeitY, New Delhi	Development glass microspheres for hydrogen storage	2014-2015	31.00

22	MeitY, New Delhi	Development of mono dispersed Copper and Aluminum nanoparticles using Plasma with OES attachment	2014-2015	57.00
23	MeitY, New Delhi	Prototype Development of Fuel Cell using nano functional materials. (In Collaboration with NIT, Warangal)	2014-2017	31.00
24	Modison Metals Ltd. Vapi	Development of microcrystalline silver powder for photovoltaic cells and EMI shielding applications	2016-2017	26.44
25	DST, New Delhi	Flexible solid-state supercapacitor device	2017-2020	18.60
26	DST, New Delhi	Novel Nanostructured HighPerformance Anode materials for High Energy Na-ion Batteries	2017-2020	68.27
27	MOIL India Ltd, Nagpur	Development of Manganese Ferrite	2018-2020	24.77
28	ISRO, Bangalore	Synthesis of nano sized AlN ceramic powder by Transferred Arc Plasma Reactor for electronic packaging applications	2018-2020	28.77
29	ISRO, Bangalore	Nanostructure NMC As A Cathode Material for Rechargeable Lithium Ion Batteries	2018-2021	25.54
30	BEL, Pune	Development of Reserve Battery (Ongoing Project)	2020-2022	20.60
31	MeitY, New Delhi	Development of hybrid battery power module with indigenously developed Super capacitor and Li-ion Cell (Ongoing Project)	2019-2020	69.70
32	MeitY, New Delhi	Three-Dimensional Nanostructure based Miniaturized and Flexible rechargeable lithium batteries for flexible electronics. (Ongoing Project)	2018-2002	456.05
33	MeitY, New Delhi	Creation of Research Facility and Training to SC/ST and women (Ongoing Project)	2019-2022	141.00
34	MeitY, New Delhi	Centre of Excellence on Additive Manufacturing (CoE-AM) (Ongoing Project)	2020-2023	896.55
35	MeitY, New Delhi & Industry	Centre of Excellence in Rechargeable Batteries (Ongoing Project)	2019-2024	2085.00
36	MeitY, New Delhi & Industry	National Centre on Quantum Materials Technology (NCQMT) (Ongoing Project)	2022-2027	5100.00
37	DST, New Delhi	Nanoscience& Q-Dot Systems: A Bridge Between Energy & Environment for Sustainable Development (Ongoing Project)	2022-2025	150.00
38	MOIL India Limited, Nagpur	Development of Nanostructured LiMn ₂ O ₄ as a Cathode Material for Lithium-Ion Batteries (Ongoing Project)	2022-2024	24.96
39	Graphite India Limited	Development of battery grade graphite (Ongoing Project)	2022-2022 (6 months)	18.00
40	MeitY, New Delhi	COE-AM: Additive manufacturing-based cost-effective optical computing chips (Ongoing Project)	2021-2025	484.13
International Projects				
1	DST, New Delhi	Solar hydrogen production using Nanostructured Fe:TiO ₂ and N:TiO ₂ thin film	2010-2013	9.14

		sand powders. Prof. Dr. Matjaz Valant Head of Materials Research Laboratory Dean of School of Environmental Sciences University of Nova Gorica Vipavska 11c, 5270 Ajdovscina, Slovenia		
2	DST, New Delhi	Nanotechnology: Synthesis and Sensing applications. (Indo-Japan)	2014-2016	8.50
3	DST, New Delhi	Efficient wastewater treatment using novel catalysts. (Indo-UKIERI)	2014-2017	4.91
4	The Royal Society of London, United Kingdom	“Engineering of a Q-dot Based Solar Radiation Harvester for Enhanced Water Evaporation and Nano Filtration” (Royal Society International Collaboration Award) (Indo-UK)	2018-2022	30.75 (£225,000.00)

On-Going / Subitted Projects:

Sr. No.	Title	Cost in Lakhs	Month of submission	Role as PI/Co-PI	Agency	Status
1	Development of Lithium and Sodium Ion cells with Solid State Variants	296.29	05/07/2024	PI	DST	Under review
2	Highly stable and safer quasi-solid and solidstate technological approach for affordable Na-ion and high energy density Li-S batteries for EVs	1080.00	04/12/2024	Lead PI	ANRF	Recommended
3	Demonstration of CO ₂ Capture and Utilization of Integrated System	311.67	27/07/2024	PI	DST	Under review
4	Quantum materials design, processing and demonstration for quantum sensors and communication prototype devices	4524.91	06/04/2024	PI	DST	Under review
5	Low dimensional rare earth doped materials and semiconductor quantum dots for single photon source and quantum sensing applications	199.21	28/09/2024	PI	DST	Under review
6	Iron and silicon	194.47	02/10/2024	PI	DST	Under review

	nanoparticles from ferrosilicon/sand using biochemical process					
7	Nanocrystalline Ayurvedic Medicine Embedded synthetic drugs for Management of Cancer, Diabetic and Pain	145.51	01/10/2024	Co-PI	DST	Under review
8	Advanced Semiconductor Quantum Dots Nanoheterostructure-Glass for Water Purification under Natural Sunlight	142.84	01/10/2024	Co-PI	DST	Under review
9	Processes of cellulose materials for sustainable batteries	12.30	19/10/2024	PI	Mid Sweden University, Sundsvall (Sweden)	In Progress

Established central research facility

- XRD
- FESEM-EDS
- FTIR
- ICP
- XRD
- FESEM-EDS
- FTIR
- ICP
- BATTERY FABRICATION
- DC/RF SPUTTERING E BEAM THERMAL/EVAPORATOR PARTICLE SIZE ANALYZER BALL MILL MONO WAVE RHEOMETER, MUFFLE FURNACE
- **Research Activity on Battery** :Cathode, anode Material for Li/ Na ion battery. Lithium Sulphur battery Anode (Nanotubes of carbon and graphene with sulphur enrichment)
- **Hydrogen Production** : Setup for Hydrogen production by using Photocatalysis process.(process quantum dot in glasses). Hydrogen setup for Biochemical process from Biomass and sugar juice
- **Hydrogen Storage** : Metal-oxide framework fabrication, CO₂ capture and CO₂ conversion from ethanol and methanol. Biodiesel from waste oil and mineral oil
- **Nano-Structure Materials** : Quantum dot in Glasses and polymer, Quantum dots in liquid crystals, N-doped oxide Semiconductor, N-doped Tungstate's, Photonic Material. Nanomaterials for antimicrobial, Combination of Ayurveda Bhasmas in Cancer drugs, Water purification under natural sunlight using quantum dots in glasses
- National Science Round Table conferences (NSRTC-24 and 25) was organised on 19th July

2024 and 18th July 2025 . Top 65 scientists have attended the conference.

13. Significant Achievements with Innovations:

- 1. Polymeric materials were designed for the testing of the swab for Covid 19**
- 2. Nanomaterial coated antibacterial face mask were prepared for protecting from Covid 19 infection**
- 3. The process for Optical fibre grade SiCl_4 (99.99%) for optical fiber cables have been developed and process has been given to Optel, Bhopal. 500Liters of SiCl_4 supplied and tested in optical fiber cables.**
- 4. Process for High surface area Mn_3O_4 for ferrite: Transferred to Sterling Oxide, Delhi (2.24 lakhs): Demonstrated 5 kg batch process.**
- 5. Process for Arsenic and Fluoride removal from drinking water: 200 litres capacity model has been established under DST program.**
- 6. Process for Electro-ceramic Grade BaCO_3 and SrCO_3 for ferrite (2kg batch) has been developed. Demonstration has been given to Permanent magnets, Mumbai**
- 7. Process for making optical cut off filters (475nm, 575nm and 715nm) for remote sensing camera of Satellite. The CdS and CdSSe semiconductor quantum dots in silica and germanium glasses have been grown with specific compositions. The TOT has been ready and ISRO will use it at any time (Exclusively for ISRO).**
- 8. The process for hydrogen production under sunlight using the Q-CdS and CdSSe-glass from H_2S has been optimized on pilot scale (innovative process). He has invented that quantum dots in glasses confer good hydrogen production under natural sunlight using waste H_2S . The patent has been filed and the conceptual process has also been demonstrated to Excel India Ltd. Mumbai. Recently, IOCL has also shown interest in this process and they are conducting the feasibility of this concept. The TOT is ready for transfer.**
- 9. Ag_3PO_4 Quantum dots of size 2-5nm developed in glass (Invention). Dr. Kale has demonstrated for the first time that glass with quantum dots of Ag_3PO_4 can be used as a photocatalyst for hydrogen production under natural sunlight from H_2S and water. These nanostructures also used for water purification under natural sunlight (Innovative process).**
- 10. The Heirarchical nanostrcures (TiO_2 , N@TiO_2 , N@ZnO , N@ZnWO_4 , MoS_2 , etc) have been developed for the production of hydrogen from water under natural sunlight.**
- 11. New nanostructured Lead free X-ray absorption materials have been developed which showed 0.25 Pb equivalence. The prototype light weight biomedical apron has been developed using these materials. The TOT is under progress for this product. Two parties have shown interest in this technology. (TOT cost Rs. 33 lakhs)**
- 12. Lead Free X-ray absorbing transparent glass has been developed and shows 0.5 Pb lead equivalence. These will be used as X-ray windows and in X-ray machines. Dr Kale has shown that Bismuth quantum dots in glass absorb X-Rays 100% (Innovation). The U.S patent has been filed. TOT is ready for transfer.**
- 13. Developed conducting polymer based inks and made circuit patterns on simple transparency. The highly efficient humidity sensors have also been made using these**

- flexible circuits. Also, developed silver-conducting polymer nanocomposite ink for sensor applications (patent is filed).
14. Conducting fabrics of Multiwall carbon nanotubes-conducting polymer has been developed and can be used for variety of applications.
 15. Developed Pt/Ni alloy nanoparticles as catalyst for fuel cell application. The catalyst is 20 % cheaper than pure Pt catalyst. The TOT is ready.
 16. Lithium and sodium ion battery fabrication facility has been established. The cathode materials such as LiCOO_2 , LiFePO_4 , LiMnO_4 and LiNiO_2 have been developed indigenously. The anode materials such as $\text{Li}_4\text{Ti}_5\text{O}_{12}$ and hard carbon have been developed indigenously. Large pouch and Button cells have been demonstrated. The TOT document has been made and now the TOT is announced.
 17. Honeycomb MoS_2 nanostructure investigated for the first time. It has been showing extremely good capacity for Na-ion battery. The full cell will be developed very soon.
 18. Investigated perforated graphene from biomass for battery and supercapacitors applications. (Invention). It shows very high capacity for Sodium ion battery.
 19. Solid state glass electrolyte and polymer electrolyte has been developed. (Invention). Solid state battery has been demonstrated using polymer electrolyte.
 20. Highly porous carbon from potato and banana has been investigated which shows good super capacitive as well as Li-ion battery performance. (Applied for the patent)
 21. The process for CdS based photopatternable silver paste has been developed. TOT has been transferred to Ant Ceramics, Mumbai (Rs. 15 lakhs)
 22. Flexible and rollable Li-ion cell has been demonstrated. The performance on different bending position is also demonstrated.
 23. CdIn_2S_4 and ZnIn_2S_4 nanostructures developed for hydrogen production
 24. Glass and polymer electrolyte (Novel approach) for flexible and Li-ion and Na-ion battery
 25. Organic cathodes and anodes for Li ion battery have been developed
 26. The Bi-Sn and Sn-Sb alloy nanopowder (20nm) have been developed which showed good X-ray absorption. The patent writing of the same is in progress
 27. NaFeMoO_4 is a new compound investigated with crystal structure for Sodium ion battery. (Invention)
 28. More than 5 conferences are arranged in C-MET and National Scientists round table conference of top 100 scientists arranged along with Dr Bhatkar and Dr Mashelkar
 29. There are 8 proposals sent to DST and MNRE through MITWPU in collaboration with IIT and IISc.
 30. Battery Facility has been created in the MITWPU.
 31. Research centres initiated at Pimpri Chinchwad University.

14. OTHER ACTIVITIES:

- Prepared Nanosized Conducting Polypyrrole and its nanocomposites with silver *via* in-situ polymerization completed its physico-chemical characterization with various analytical techniques.
- The synthesized polypyrrole nanofibers were tested for antibacterial/antimicrobial activities and for the Urea biosensor application.
- Prepared ZnO-Polyaniline nanocomposite for sensor application.
- Prepared Silver/Gold/Cobalt - Polyaniline nanocomposite for sensor application
- Optimized Synthesis of Polyaniline-V₂O₅ Nanocomposite for battery applications.
- In-situ synthesis of MWCNT – PMMA nanocomposite.
- Synthesis and characterization of Graphene Oxide – Polyaniline nanocomposite
- CdS-polyamide nanocomposite
- Fluorine doped conducting polymers
- Synthesis of carbon dot
- Synthesis of ZnO/N-ZnO, TiO₂, N-TiO₂ –graphene nanocomposites.
- Synthesis of graphene in glass matrix
- PbTe nanoparticles for thermoelectric
- BaSrBi₂S₄ and SrBi₂S₄ nanorods for Field emission.
- Development of Sono-hydro- reactor
- Development of BaBi₂S₄ on reaction calorimeter.
- Development of stable Copper nanoparticles using co-precipitation method.
- Growth of LiVO₃ nanoparticles in Polyaniline
- Synthesis of LiVO₃ by hydrothermal.
- Synthesis of CdS/ZnS core shell by solid state method.
- ZnIn₂S₄ by microwave
- CdS quantum dots for magneto-optical application.
- Cu@ZnO for sensors.

15. ADMINISTRATIVE RESPONSIBILITIES:

- Overall, in charge of FESEM and XRD characterization.

- Chairman Purchase committee
- Member Laboratory Management committee.
- Writing publications, papers, report, patents and proposals.
- Guidance to all projects (Project staff) mentioned above and Ph.D students (22 No.)
- Director, C-MET, Pune (since March 2014)
- Director General (A) (since 1st June 2020) Additional Charge.
- Director General, Centre for Materials for Electronics Technology
- Director Materials Science R & D , MITWPU
- Director, Research and Development , Pimpri Chinchwad University, Pune

16. TECHNOLOGIES COMPLETED AND STATUS

Technology Transferred/Patents, If any.

a) Technologies Completed and Transferred:

1. Alcohol by continuous fermentation process (NCL) : Transferred
2. Optical Fibre Grade Silicon Tetrachloride (99.999): Transferred to Optel , Bhopal
3. Electronic Grade Barium and Strontium carbonate for ferrite : Cosmo ferrite and ACC Thane (demonstrated)
4. Removal of Arsenic and fluoride from ground/waste water: 200 liter prototype model. Demonstrated
5. MOS grade Isopropyl alcohol : Transferred to Local Industry (Sharad Gore)
6. Characterization of H₂O₂ for Asian peroxide - (1.00 lac)
7. Chlorination of Organic compounds by NCL / GE (0.25 lakhs)
8. BET Improvement of Manganese oxides from M/S Sterling oxide- (2.25 Lacs) : Consultancy
9. Development of Lead Free X-ray shielding nanomaterials and Nanocrystalline glasses (TOT announced in newspapers)
10. Development of Lead free light weight X-ray protective Biomedical apron. (TOT announced in newspapers)
11. Hydrogen production from H₂S using Semiconductor glass Nanocomposites under solar light (Interest shown by IOCL and ONGC)
12. Large Scale synthesis of CdS nanoparticles – Technology ready
13. Large scale synthesis of ZnS Nanoparticles – Technology ready
14. Development of N-TiO₂ and N- ZnO for Hydrogen production - Technology ready
15. Development of Nanostructured Spinel's, CdIn₂S₄ and ZnIn₂S₄ for Hydrogen production under solar light - Technology ready

16. Optical cut off filters for ISRO: Demonstrated (50 mm diameter)
17. Lithium ion battery electrode materials (TOT ready)
18. Lithium ion battery fabrication (TOT ready)
19. Fuel cell nanocatalyst, PtNi, PtCoNi, PtNiC (TOT ready)
20. PEM fuel cell fabrication process (TOT ready)
21. Magneto optical glasses (Novel product)
22. Perforated graphene (Novel product)
23. Quantum dot glasses (new products)
24. Honey comb structured MoS₂ for battery (new product)
25. Nanohetrostructures such as CdS@ZnWO₄, CdS@MoS₂

17 Research Leadership Achievements at MIT-WPU (Since September 2023)

Since joining MIT-WPU in September 2023, I have spearheaded a transformative shift in the university's research ecosystem, establishing foundational infrastructure, fostering interdisciplinary collaboration, and driving national-level project submissions. Key milestones include:

☐ Infrastructure Development

- Central Characterization Facility: Conceived and executed the setup from equipment specification to installation. Now operational and generating revenue through external institutional access on a chargeable basis.
- Central Processing Facility: Established advanced capabilities including Lithium-ion and Na-ion processing, semiconductor deposition, and optical glass fabrication. Open to all departments; over 25 research papers have been published utilizing this facility.
- Hydrogen Generation Facility: Built state-of-the-art hydrogen production setups in both R&D and large-scale formats within Chemical Engineering.

☒ Innovation & Intellectual Property

- Hydrogen from Sugar: Successfully demonstrated hydrogen production from sugar under my guidance in Chemical Engineering. Patent filed for this novel process.
- Synthesis Techniques: Developed and standardized synthesis methodologies within R&D, enabling high-quality material development.

☒ Strategic Research Growth

- Project Mobilization: Facilitated submission of research proposals exceeding ₹100 Crores to ANRF, MNRE, and DBT, in collaboration with faculty from Science, Engineering, and Pharmacy.
- Faculty Engagement: Initiated regular research faculty meetings to ideate and develop fundable projects, fostering a culture of innovation and accountability.
- Mentorship Impact: Cultivated a competitive research spirit among young faculty members, leading to increased scholarly output and collaboration.

Outreach & Visibility

- Institutional Promotion: Amplified MIT-WPU's research visibility through social media and invited talks at premier institutions including IITs, NITs, IISc, and IISERs.
- Admissions Boost: Enhanced enrollment in Material Science, Chemistry, and Physics programs through targeted outreach in rural colleges.

Intellectual Contributions & Strategic Initiatives

Over the past two years, I have led and contributed to significant advancements in research, innovation, and institutional development at MIT-WPU. Highlights include:

Scholarly Publications & Patents

- 25 peer-reviewed journal articles published as corresponding author, primarily in prestigious journals such as those of the Royal Society (UK).
- 2 patents filed, reflecting novel contributions to sustainable energy and advanced materials.

Process Development & Technological Innovation

- Hydrogen from Sugarcane Juice: Successfully developed and demonstrated a process for hydrogen generation from sugarcane juice under my guidance.
- Sodium Battery Materials: Established synthesis protocols for sodium-ion battery materials.
- Na-ion Battery Demonstration: Developed functional Na-ion battery prototypes with display integration; training modules for engineering students have been planned to support skill development.
- Solar Cell Fabrication: Initiated the setup of a solar cell fabrication facility to support renewable energy research.

Institutional Leadership

- Centre of Excellence Development: Entrusted by the university to establish five strategic Centres of Excellence:
 1. Battery Research
 2. Water Technologies
 3. Hydrogen Generation and Storage
 4. Solar Cell Materials
 5. Quantum Materials and Devices

Administrative Leadership & Strategic Planning at MIT-WPU

Since joining MIT-WPU, I have played a pivotal role in strengthening the university's research governance, organizing national-level scientific events, and ensuring fiscal discipline. Key achievements and responsibilities include:

Institutional Governance & Certification

- Established the Research Advisory Board to guide and monitor research activities across departments.
- Revived and advanced the DSIR (SIRO) certification process, resolving a two-year delay and aligning MIT-WPU with national research recognition standard
- Successfully organized NSRTC 2025, with participation from 36 Bhatnagar Awardees, further elevating MIT-WPU's national research profile.

18 Patents

- 1 Barium Zirconium Oxide ($\text{BaZrO}_3\cdot\text{BaCO}_3$) Nanoparticles. **Bharat B. Kale**,* Milind V. Kulkarni, Rajendra P. Panmand, Ujjwala V. Kawade, Sanjay K. Apte, Sonali D. Naik, Jalindar D. Ambekar, Ravindra S. Sonawane, R. Marimuthu, Dinesh P. Amalnerkar, Nilofer Shroff, Sandip Chatterjee, US Pat No 20140170088 Dated 19.06.2014. (Granted)
- 2 X-Ray Shielding Materials And Method Of Preparation Thereof, **Bharat B. Kale**,* Milind V. Kulkarni, Rajendra P. Panmand, Ujjwala V. Kawade, Sanjay K. Apte, Sonali D. Naik, Jalindar D. Ambekar, Ravindra S. Sonawane, R. Marimuthu, Dinesh P. Amalnerkar, Nilofer Shroff, Sandip Chatterjee, US 2015/0287485 A1, Dated 8.10.2015. And Wo/2014/097316 Published Date 26/6/2014 (Granted)
- 3 Solar Light Driven Hydrogen Production By Novel Orthorhombic CdS Qds GeO_2 , Glass Nanocomposite. Sanjay K. Apte, **Bharat B. Kale**,* Sunil N. Garaje, Milind V. Kulkarni, Ravindra S. Sonawane, Sonali D. Naik, Jalindar D. Ambekar, G. V. Ramaraju And Ramesh Chanda Submitted To Meity: Dec 2011. (Indian Patent Filed No. 3529/Mum/2012)
- 4 A Process For Preparing ZnIn_2S_4 Nanoparticles And Uses Thereof. Kale Bharat B., Sonawane Ravindra S., Chaudhari Nilima S., Bhirud Ashwini P., Kulkarni Milind V, Naik Sonali D., Apte Sanjay K And Ambekar Jalindar D. Jan 2014 (Application No 352/Mum/2014)
- 5 Barium Zirconium Oxide ($\text{BaZrO}_3\cdot\text{BaCO}_3$) Nanoparticles, **Bharat B Kale***, Milind V. Kulkarni, Rajendra P. Panmand, Ujjwala V Kawade, Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane And Dinesh P. Amlanerkar, Sandip Chatterji , Nilofer Shroff (Indian Patent Filed No. 3550/Mum 2012)
- 6 X-Ray Shielding Materials And Methods Of Preparation Thereof. **Bharat B Kale***, Milind V. Kulkarni, Rajendra P. Panmand, Ujjwala V Kawade, Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane, Dinesh P. Amlanerkar, Sandip Chatterji , Nilofer Shroff (Indian Patent Filed No. 3551/Mum 2012)
- 7 Cadmium Sulfide In GeO_2 Based Glass Nanocomposite, Sanjay K. Apte, **Bharat B. Kale***, Sunil N. Garaje, Milind V. Kulkarni, Ravindra S. Sonawane, Sonali D. Naik, Jalindar D. Ambekar, G. V. Ramaraju And Ramesh Chand (Indian Patent Filed No. 3529/Mum/2012)
- 8 Development Of Polyaniline Multi Wall Carbon Nanotubes Coated Electrically Conductive Fabrics, Milind V. Kulkarni, **Bharat B Kale***, Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane , Dinesh P. Amlanerkar. (Filed An Indian Patent) (Patent Application No. 2141/Mum/2011).

- 9 Development of Ink Jet Printable Conducting Polyaniline Based Ink For Flexible Electronic Application. Milind V. Kulkarni, **Bharat B Kale***, Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane, (Filed An Indian Patent) (Patent Application No. 2140/Mum/2011).
- 10 Method for Preparing Magneto-Optical Glass Comprsing Bi_2Te_3 Nanocrystals. **Bharat B Kale***, Milind V. Kulkarni, Rajendra P Panmand , Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane , Dinesh P. Amlanerkar. Sandip Chatterji And Nelofer Shroff (Filed An Indian Patent) (Patent Application No. 242/Mum/2013). Publication Date 14/11/2014.
- 11 Method For Fabrication Of Bi_2S_3 Glass Nanocompiste Comprsing Mn^{2+} , **Bharat B Kale***, Milind V. Kulkarni, Rajendra P Panmand , Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane, Dinesh P. Amlanerkar, Sandip Chatterji And Nelofer Shroff (Filed An Indian Patent) (Patent Application No. 467/Mum/2013).
- 12 A Process Of Preparation Of Cadmium Sulphide/Glass Nanocomposite Containing CdS Quantum Dots Sanjay K Apte, **Bharat B Kale***, Milind V. Kulkarni, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane (Patent No 255381) (**Granted 2013**)
- 13 Glass Composite And Method Of Preparation Thereof, **Bharat B Kale***, Milind V. Kulkarni, Ravindra S Sonawane, Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Suresh W. Gosavi, (Patent Application No.1504/Mum/2014, Dated, 30.04.2014).
- 14 Partial Replacement of Pt Catalyst Using Non-Noble Functional Nanomaterials, S. H. Sonawane, Prashant L. Suryawanshi And P. Rajesh Kumar, **Bharat B. Kale***, Milind Kulkarni (Granted 2015) Application No.: 5619/Che/2015 A, Publication Date: 19/10/2015
- 15 Shirish Sonawane Prashant, Surywanshi, Rajesh Kumar, **Bharat B Kale*** “Constructive Design and Fabrication of Polymer Electrolyte Membrane (Pem) Fuel Cell Stack and Its Components”. Application No E-101/22190/2017-Che 201741033677 Dated 09/22/2017
- 16 Q-Cds /Glass Nanocomposite Conating CdS Quantum Dots. **Bharat B. Kale***S. K. Apte, R. S. Sonawane, S. D. Naik Patent No. 255382
- 17 Development of New Claus Process for Photocatalytic Decomposition Of H_2S Using Novel Metal Oxide Photocatalyst. J. S. Yoo, J. O. Baeg, C. W. Lee, **Bharat B Kale***, and W. Dong, Korea Patent No 04-0083366 (Oct. 19, 2004).
- 18 Improvement In Process Related To Preparation Of High Surface Area Hausmannite (Mn_3O_4) Powder: **Bharat B Kale***, S.K. Apte, R.S. Sonawane, A.V. Murugan And B.K. Das: Registered No. 942/Del/ 2002 –; Patent. No 248285
- 19 A Novel Process for the Preparation of Nano-Structured Organo-Inorganic Hybrid Materials as High Energy Density Cathode for Rechargeable Lithium Battery: A. V. Murugan, **Bharat B Kale***, B. K. Das and Vijayamohan: **Registered No. 915/Del/2002.**
- 20 An Improved Process for the Production of Calcium Cynamide **Bharat B. Kale***, S. B. Jagtap, A.R. Pande, V.G. Neurgaonkar and A.N. Gokarn Indian Patent Filed (CSIR Patent No. 705/Del/91).
- 21 Proposed Complete Application for "Synthesis of lithium nickel Manganese cobalt oxide $\text{LiNi}_{0.36}\text{Mn}_{0.33}\text{Co}_{0.31}\text{O}_2$ as a cathode material for high energy density lithium ion batteries"

- Bharat B Kale***, Milind V. Kulkarni, Rajendra P Panmand , Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane.
- 22 Synthesis of Lithium Iron phosphate and carbon coated LiFePO_4 as a cathode material for high energy Density lithium ion batteries. **Bharat B Kale***, Milind V. Kulkarni, Rajendra P Panmand , Sanjay K Apte, Sonali D Naik, Jalindar D Ambekar, Ravindra S Sonawane. Submitted on February 2019.
- 23 Solvate Ionic Liquid Incorporated CTA Nanofibre as an Electrolytic System for Rechargeable Li-ion Batteries **Bharat B. Kale**, Dr. Milind V. Kulkarni, Dr. Ramchandra S. Kalubarme, Dr Nageshwar Khupse, Rushikesh Kale, Sahebrao S More, (Submitted for Indian Patent).
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56. Electrochemical evaluation of LiCoO₂ synthesized by sol gel method for lithium-ion battery applications Ujjwala Chothe, Anuradha Ambalkar, Sajay Apte, Sonali Naik, Milind V. Kulkarni, Bharat B. Kale, International Conference on Advanced Rechargeable Batteries & Allied Materials (ICARBM-2017) held on March 8-10, 2017 at C-MET, Pune.
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61. Nanowires of Ni substituted MnCo_2O_4 as an anode material for high performance lithium-ion battery, Asiya F. Shaikh, Ramchandra S. Kalubarme, Mohaseen S. Tamboli, Santosh S. Patil, Milind V. Kulkarni, Deepak, R. Patil, Suresh W. Gosavi, Chan-Jin Park, Bharat B. Kale, International Conference on Advanced Rechargeable Batteries & Allied Materials (ICARBM-2017) held on March 8-10, 2017 at C-MET, Pune.
62. Implementation of 3 To 6 series cell lithium-ion battery monitor and secondary, protection technique for EV & HEV applications, Deepak Kajale, Anil Kumar, Milind V. Kulkarni, Bharat B. Kale, International Conference on Advanced Rechargeable Batteries & Allied Materials (ICARBM-2017) held on March 8-10, 2017 at C-MET, Pune.
63. Highly flexible liquid-free supercapacitive device modulated through vanadium oxide encapsulated carbon nanotubes Bidhan PanMeitY, Bharat B. Kale, Babasaheb R. Sankapal, International Conference on Advanced Rechargeable Batteries & Allied Materials (ICARBM-2017) held on March 8-10, 2017 at C-MET, Pune.
64. Hierarchal PANI- MnO_2 nanocomposite via dynamic interfacial polymerization, for electrochemical energy storage Sangita M. Thorat, Ujjwala V. Kawade, Gaurav M. Thorat, Bharat B. Kale, Milind V. Kulkarni, International Conference on Advanced Rechargeable Batteries & allied Materials (ICARBM-2017) held on March 8-10, 2017 at C-MET, Pune.
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66. Synthesis and characterization of carbon supported pt catalyst for polymer, electrolyte membrane fuel cell Shashikant Tekale, Rajendra Panmand, Sunil Kadam, Prashant Suryawanshi, Rajesh Kumar, Shirish Sonawane, Bharat B. Kale International Conference on Advanced Rechargeable Batteries & Allied Materials (ICARBM-2017) held on March 8-10, 2017 at C-MET, Pune.
67. Combustion synthesis of porous ZnO nanostructures for lithium ion batteries, Shrinivas C. Motekar, Sudhir S. Arbuj, Govind Umarji, Sunit Rane, International Conference on Advanced Rechargeable & Allied Materials (ICARBM-2017) during March 8-10, 2017 at Pune.
68. Hexagonal SnS_2 nanoplates as anode material for rechargeable lithium ion batteries, Shubhangi Damkale, Sudhir Arbuj, Govind Umarji, Mohaseen Tamboli, Bharat Kale and Sunit Rane, International Conference on Advanced Rechargeable & Allied Materials (ICARBM-2017) during March 8-10, 2017 at Pune.
69. MoO_3 -PPS nanocomposite: in-situ generation and superior dielectric performance, Nilam Qureshi, Manish Shinde, Milind Kukarni, Bharat Kale, Anand Bhalerao and Dinesh P. Amalnerkar, International Conference on Advanced Rechargeable Batteries & Allied Materials (ICARBM-2017) held during March 8-10, 2017 at C-MET, Pune.

Invited Talk: More than 200

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