Dr. Hema Bhandari

Designation: Assistant Professor

Address: Department of Chemistry, Maitreyi College, University of Delhi, Chanakyapuri, New Delhi-110021, India.

E-mail : hbhandari@maitreyi.du.ac.in (Mob. 9818080719)

Area of Specialization: Conducting polymers, Nanomaterials**,** anticorrosive and antistatic coatings, Polymer Processing and Technology, Photocatalyst.

Educational Qualifications

- **Ph.D (Polymer Science and Engineering)** -Indian Institute of Technology (IITDelhi) & NPL (CSIR) New Delhi, Title "synthesis, characterization and Evaluation of Conducting Copolymers for Corrosion Inhibitors and Antistatic Applications"
- **UGC-CSIR (JRF)** Chemical sciences
- **MSc.(Organic Chemistry**) Kumaon University, Nainital (Uttarakhand)-Ist Division
- **BSc. (Life Science)** Rohilkhand University, Bareilly (U.P).Ist Division.

Career Profile

- **Assistant Professor : August 2011- Till date,** Department of Chemistry , Maitreyi College, University of Delhi, India,
- **Research Associate : May 2011 -July 2011** National Physical Laboratory (CSIR) and IIT Delhi, New Delhi, India
- **Senior research Fellow:** Jan 2009- Jan, 2011, National Physical Laboratory (CSIR) and IIT Delhi, New Delhi, India.
- **Junior Research Fellow: Jan 2006-Dec 2008** National Physical Laboratory (CSIR)/IIT Delhi, New Delhi, India

Fellowships and Awards

1. Qualified National Eligibility Test (NET) **Lectureship award** (Chemical Science) on Dec.2004.

2. Recipient of **Junior Research Fellowship** (JOINT CSIR-UGC NET) in Chemical Science since June, 2005.
3. Received **Best Poster Presentation Award** in International conference on "Advances in polymer science & Technology (Poly 2008)" January 28-31, 2008.
4. Received **Best Presentation Award** in International conference on "Frontiers of Polymers and Advanced Materials (Macro-2010)" December 15-17, 2010.
5. Patent No. **US2015/0184304 A1 (**3813DEL2013) (Self Healing Anticorrosive Coatings and a Process for the Preparation Thereof). This Innovation won the **Gold Medal** under **"DST-Lockheed Martin Innovation Growth Programme 2014 ".** This award was given by Sr.Vice president and chief tech.officer,Lockheed Martin Corporation, USA.
6. **Start-Up Research Grant** funded by University Grant Commission (UGC)-2015 (6 Lakhs).

List of Papers Publised in Internation Journals

https://orcid.org/0000-0002-2723-032X

1. Brijesh K. Shukla, Mayank K. G, Shalu Rawat, C. Bhan, Hema Bhandari, J Singh, and Seema Garg. Statistical optimization of process conditions for photocatalytic degradation of phenolwith bismuth molybdate photocatalyst. Reaction Kinetics, Mechanisms, and Catalysis volume **135**, 2175–2194 (2022). https://doi.org/10.1007/s11144-022-02236-4 (Impact Factor:2.081).

2. Shailja Mittal, Seema Garg, Hema Bhandari , V. Sharma, A review on recent progressions of Bismuth ferrite modified morphologies as an effective photocatalyst to curb water and air pollution,, Inorganic Chemistry Communications 144 (2022) 109834. (Impact Factor 3.8) ISSN 1387-7003.

3. B. K. Shukla, Shalu Rawat, M. K. Gautam, Hema Bhandari, Seema Garg, and Jiwan Singh,(2022) Photocatalytic Degradation of Orange G Dye by Using Bismuth Molybdate: Photocatalysis Optimization and Modeling via Definitive Screening Designs. Molecules 27, no. 7: 2309. DOI:10.3390/molecules27072309. (Impact Factor:4.412)

4. Brijesh K. Shukla, Himanshi Tyagi, Hema Bhandari, Seema Garg, Nanotechnology-Based Approach to Combat Pandemic COVID 19: A Review. Macromol. Symp. 397(1): 2000336. 2021, DOI: 10.1002/masy.202000336.n international Journals:

5. Brijesh K. Shukla, Shalu Rawat, Hema Bhandari, Seema Garg, and Jiwan Singh. A sustainable approach for the synthesis of bismuth molybdate by continuous flow method using custom, design reactor and their photocatalytic application for environmental remediation. Applied,Nanoscience, 12, Issue 8, 2497-2509, ISSN 2190-5517, (Impact Factor:4.604).

6. Brijesh K. Shukla, Mayank K. Gautam, Shalu Rawat, Hema Bhandari, Jiwan Singh, and Seema Garg. A sustainable approach for the removal of toxic 4-nitrophenol in the presence of H2O2 using visible light active Bi2MoO6 nanomaterial synthesized via continuous flow method (Reaction Kinetics, Mechanisms and Catalysis volume 136, pages1737–1755, 2023)

7. Hema Bhandari and Seema Garg and Ritu Gaba, Advanced Nanocomposites for Removal of Heavy Metals from Wastewater, Macromolecular Symposia, https://doi.org/10.1002/masy.202000337, 2021.

8. Mishra, M., Singh, A.P., Kumar, M, H.Bhandari, M.Chand Investigation of the microwave absorbing properties on polymer sheets. *J Mater Sci: Mater Electron* **32,** 25963–25972 (2021). https://doi.org/10.1007/s10854-021-05485-6 .

9. Himanshi Tyagi, Harshita Chawla, Hema Bhandari, Seema Garg, Recent-enhancements in visible-light photocatalytic degradation of organochlorines pesticides: A review, Materials Today: Proceedings, 49, Part 8,2022,3289-3305,ISSN 2214-7853,https://doi.org/10.1016/j.matpr.2020.12.1036.

10. Eco-friendly magnetic biopolymer nanocomposites for removal of organic dye /heavy metals from waste water, Bhandari, H., Ruhi , R., Gaba, R., Chaudhary, A., Johar, R., Singh, T., Rawat, A., Kapoor, S., Sharma, V., Chadha, Y. Vantage: Journal of Thematic Analysis, 2020, 1, 17-31.http://maitreyi.ac.in/Datafiles/cms/2020/magzine/vantage/august/2.pdf

11. B.M. Singh, **Hema Bhandari**, G.Ruhi, S.P.Gairola, S. K Dhawan, Evaluation of an advanced self healing and highly durable corrosion protective epoxy coating modified with Poly(Aniline-co-Pentafluoroaniline)/ZrO_2, Nanocomposite on Mild Steel" **Current Smart Materials, Bentham Science, 2(2), 2017,130-145.**

12. G.Ruhi, P. Sambyal, **Hema Bhandari**, H. Chopra, S. K. Corrosion protection of mild steel by environment friendly Polypyrrole/Gum Acacia Composite Coatings, Dhawan, Advanced Materials Letters, 2018, 9(3), 158-168, ISSN; 09763961,0976397X.

13. B.M. Singh**, Hema Bhandari,** S.Gairola and S. K Dhawan "Development of conducting copolymer based on poly(o-toluidine-co-2-amino 5 napthol 7 sulphonic acid): an efficient material for protection of iron in highly corrosive environment" **International Journal of Research in Engineering and Technology, 5 (11), 2016, ISSN: 2319-1163.**

14. B.M Bisht, **Hema Bhandari**, P. Sambyal, S. Gairola, S. K. Dhawan, "Highly Durable and Novel Anticorrosive Coating Based on Epoxy Reinforced with Poly(Aniline-co-Pentafluoroaniline)/SiO_2 Composite" **American Journal of Polymer Science 2016, 6(3): 75-85 DOI: 10.5923/j.ajps.2016,0603.03 ISSN: 2163-1344.**

15. P Sambyal, G Ruhi, **Hema Bhandari** and S. K. Dhawan, "Advanced Anti Corrosive Properties of Poly(aniline-co-o-toluidine)/flyash Composite Coatings", **Surface and coating technology**, 272, 129-140, 2015.

16. Anand, N. Rani, P. Saxena, **Hema Bhandari** and S.K.Dhawan "Development of Polyaniline /Zinc Oxide nanocomposite impregnated fabric as an Electrostatic Charge Dissipative Material" **Polymer International" DOI: 10.1002/pi.4870,(ISBN No: 1097-0126**).

17. S.K.Dhawan, A.K.S, **Hema Bhandari**, B..S.Bisht "Development of Highly Hydrophobic and Anticorrosive Conducting Polymer Composite Coating for Corrosion Protection in Marine Environment, **American Journal of Polymer Science,** 5(IA): 7-17, 2015, **ISSN:** 2163-1344

18. G. Ruhi**, Hema Bhandari**, S.K.Dhawan "Corrosion Resistant Polypyrrole/flyash Composite Coatings Designed for Mild Steel Substrate" **American Journal of Polymer Science,** 5(IA): 18-27, 2015, **ISSN:** 2163-1344.

19. G.Ruhi, **Hema Bhandari**, S.K.Dhawan "Designing of corrosion resistance epoxy coating embedded with polypyrrole /SiO_2 composites" **Progress in organic coating,** 77 (9) 2014, 1484. **(**DOI**:** 10.1016/j.porgcoat.2014).

20. A Kumar.S, **Hema Bhandari** and S.K. Dhawan "A New Smart Coating of Polyaniline- SiO_2 Composite for Protection of Mild Steel against Corrosion in Strong Acidic Medium" **Polymer International**" 62, 2013, 1192-1201.

21. **Hema Bhandari,** V. Choudhary and S.K. Dhawan, "Influence of Self Doped Poly(aniline-co-1-amino-2-naphthol-4-sulphonic acid) on Corrosion Inhibition Behavior of Iron in Acidic Medium" **Synthetic Metals,** 161, 2011, 753-762. **(This paper has also been selected as a best paper in Int. Conference in Synthetic metals, Canada 2011).**

22. **Hema Bhandari**, V. Choudhary and S.K. Dhawan, "Enhancement of Corrosion Protection Efficiency of Iron by Poly (aniline-co-amino-naphthol-sulphonic acid) Nanowires Coating in Highly Acidic Medium", **Thin Solid Film**, 519(3), 2010, 1031-1039**. (This paper has been selected for "Nanotechnology Weekly (Vertical News) Jan 24, 2011).**

23. **Hema Bhandari**, S. Singh, V. Choudhary and S.K. Dhawan,"Conducting Films of Poly (aniline-co-1-amino-2-naphthol-4-sulphonic acid) Blended with LDPE For Its Application as Antistatic Encapsulation Material", **Polymers for Advanced Technologies**, DOI: 10.1002/pat.1612.

24. **Hema Bhandari**, V. Bansal, V. Choudhary and S.K. Dhawan, "Influence of Reaction Conditions on the Formation of Nanotubes/Nanoparticles of Polyaniline in the Presence of 1-amino-2-naphthol-4-sulphonic Acid and its Applications as Electrostatic Charge Dissipation Material" **Polymer International**, 58, 2009, 489.

25. V. Bansal, **Hema Bhandari**, M.C.Bansal and S.K. Dhawan, "Electrical and optical behavior of poly(aniline-co-8-anilino-1-napthalene sulfonic acid)-A

material for ESD applications" **In. Journal of Pure and Applied Physics,** 47(9), 2009 613.

26. P. Saini, **Hema Bhandari**, V. Choudhary and S.K. Dhawan,"Thermal, Spectroscopic and Electrical Transport Properties of Processable Poly(aniline-co-alkyl aniline) Copolymers" **In. Journal of Engineering & Material science**, 15, 2008, 505.

27. **Hema Bhandari**, V. Choudhary and S.K.Dhawan,"Synergistic Effect of Copolymers Composition on the Electrochemical, Thermal and Electrical Behaviour of 5-Lithiosulphoisophthalic Acid Doped Poly(aniline-co-2-isopropylaniline) : Synthesis, Characterization and Applications", **Polymers for Advanced Technologies** 20(12), 2008, 1024-1034.

28. **Hema Bhandari**, S. Sathiyanarayana, V. Choudhary and S.K.Dhawan, "Synthesis and Characterizations of Proccessible Polyaniline Derivatives for Corrosion Inhibition." **Journal of Applied Polymer Science,** 111, 2008, 2328-2339.

Publications in Conference Proceeding:

- S. Pandey, P. Saxena, R.Dhingra, **Hema Bhandari**, Meghna Tiwari, Meenakshi Dudeja and S.K.Dhawan "Development of Environmentally Friendly Novel Membrane Based on Activated Carbon Fibre Modified with Polyaniline-ZnO Nanocomposite in DBSA MEDIUM for Removal of *E.coli* and Total coliform Bacteria from Waste Water" Paper published in Conference proceeding" National Seminar on environmental economics and social sustainability" **EESS-2014 , ISBN: 978-81-920509-5-8.**
- R Kumari, **Hema Bhandari,** R. Sharma, N. Vats "Development of an Environmentally Friendly and Highly Durable Smart Coating of Conducting Polymers Nanotubes for Marine Application" Paper published in Conference proceeding National Seminar on environmental economics and social sustainability, **EESS-2014 , ISBN: 978-81-920509-5-8.**
- A.Chopra, **Hema Bhandari**, S.K.Dhawan, Biocidal and Antistatic Performance of fabric modified with Polyaniline Microtubes: An Efficient Material for Waste

Water Treatment. Paper published in Conference proceeding National Seminar on environmental economics and social sustainability, EESS-2014, ISBN: 978-81-920509-5-8.

Patents

- S.K. Dhawan, A. Kumar.S, **Hema Bhandari**, Gajala Ruhi "Self Healing Anticorrosive Coatings and a Process for the Preparation Thereof. US Patent No; **US2015/0184304 A1.**
- S.K.Dhawan, **Hema Bhandari**, B.M.S.Bisht, Swati Vashney, R.K Kotnala "An effective antimicrobial treatment of waste water using modified conducting polymer nanocomposites grafted into activated carbon membrane" Indian & US Patent **Application No.: 10008/DEL/2013.**
- A Process of preparation of smart coatings of conducting polymers composites for corrosion protection in marine environment. S.P.Gairola, B.M.S.Bisht, **Hema Bhandari**, P. Sambyal and S.K.Dhawan, Indian Patent (Granted by Government of India) No.:**369797 on 21/06/2021.**

Book Authored

Book Publication: "Corrosion Preventive Materials & Corrosion Testing" CRC Press Taylor & Francis Group, Florida, USA. S.K.Dhawan, **Hema Bhandari**, Gazala Ruhi, B M. S. Bisht & Pradeep Sambyal **ISBN:978-1-138-11875-1, March 2020.**

Book Chapters

1. **Hema Bhandari,** A Kumar.S and S.K. Dhawan **"**Conducting polymer nanocomposites for anticorrosive and antistatic applications" **InTech Nanotechnology-New Trends and Developments,** book edited by Farzad Ebrahimi, ISBN 978-953-51-0762-0, Published: September 27, 2012**.**
2. **Hema Bhandari,** S. Vashney, A.K.Saxena, V.K.Jain and S.K. Dhawan "Conducting polymer nanocomposites for removal of E-coli and Total coliform from waste water". **Nanotechnology for Waste Water Treatment. PAN STANDFORD PUBLISHER, USA, ISBN: 978-981-4463-54-6 Edited by A.K.Mishra, page 221-247.**

3. **Hema Bhandari**, Diwan S. Rawat, Seema Garg. Graphene-Based Nanocomposites for Photocatalytic Applications: Emphasis on Environmental Remediation. **2022,** 77-110. https://doi.org/10.1007/978-3-030-77371-7_4, Springer Nature , 978-3-030-77370-0 ISBN.

Research Paper Highlighted in News

Hema Bhandari, Veena Choudhary and S.K. Dhawan "Enhancement of Corrosion Protection Efficiency of Iron by Poly (aniline-co-amino-naphthol-sulphonic acid) Nanowires Coating in Highly Acidic Medium", **Paper highlighted in News as the best innovation "Nanotechnology Weekly (Vertical News) Jan 24, 2011).**

Invited Talks/ Seminar/Webinar/Workshop:

1. **Invited Speaker: International Seminar** Global Congress on Catalysis, Chemical Engineering and Technology (CATALYSIS2024), March 22, 2024, Rome, Italy. (Virtual Mode).
2. **Invited Lecture;** International Conference Recent Advances in Science & Technology Organized by IITyam India Academy in collaboration with HNB Govt. PG College, Khatima India.4-5 Nov, 2023**, Virtual Mode.**
3. **Invited Speaker** Industrial Application of Nanocomposites" 110th National Foundation day at NTH, Ministry of Consumer Affairs,30 August, 2022.,60 Min. National Test House, Ministry of Consumer Affairs, NR Kamla Nehru Nagar, Ghaziabad (U.P). Offline Mode.

4. **Invited Lecture** "New Aged conjugated Polymer Nanocomposites Based coatings and their Applications" National Webinar, 25 July 2021. 60 Min. Organized by Shree Vidyadhiraj NSS College Vazhoor Kerala, India.

5. **Invited Lecture on** Smart Conjugated Polymers Designing with anticorrosive Properties. FDP-Emerging Areas of Research in Science and Environment 07 June,

2021, Humanities and Applied Sciences, KC College of Engineering & Management studies and Research, Thane, Mumbai.

6. **Resource person** on Workshop "**Fundamental and Practical Aspect of Biochemistry**, 7-8 SEPTEMBER 2012 at MAITREYI COLLEGE, New Delhi.

7. **Resourse Person** in the Special Orientation Programme for Fundamental Course In Science And Life for FYUP Held On 19 August 2013 At University Of Delhi, South Campus.

Refresher Courses/Faculty Development Programme

- 2-Week FacultyDevelopment Programme on Research Methodology, Ramanujan College, University of Delhi, Oct. 01, 2020 Oct. 15, 2020, University of Delhi, Under the aegis of MHRD, Pandit Madan Mohan Malaviya National on teachers and Teaching.

- Refresher Course in Contemporary Studies, HRDC, CPDHE, University of Delhi, Delhi, June 07, 2016 -June 27, 2016, UGC-HRDC, 2-Week Faculty Development Programme on Managing Online Classes and Co-Creating Moocs, 3.0.

- FDP- Ramanujan College, University of Delhi July 25, 2020, August 10, 2020, Ministry of Human Resource Development (MHRD), 4-weeks Faculty Training Program on Google applications, Department of Computer Science, Maitreyi College, University of Delhi July 16, 2020 -August 10, 2020 Maitreyi College, University of Delhi.

Project Undertaking

- **INNOVATION PROJECT** Entitled "Waste Water Treatment and Corrosion Protection by Development and Evaluation of Conducting Polymer Nanocomposites Impregnated Materials" Maitreyi College D.U, Funded by University of Delhi, Project No: MTC201-2013-2014.(Grant :10 Lakh).
- **STAR COLLEGE PROJECT** Entitled "Smart and self healing coating of epoxy conducting polymer nanocomposites for protection of iron in highly corrosive

condition" Granted by Department of Biotechnology, Working place: Maitreyi college.

- **UGC START UP PROJECT** Entitled "Development of Conducting Polymer Nanocomposites Decorated Materials for Antistatic and Antimicrobial Applications (Project Recommended by University Grant Commission, 2016). (Grant :6 Lakh).

CO-Supervisor of PhD Students

1**. Dr. Brijesh Kumar Shukla- PhD awarded**

Title "Synthesis and Evaluation of Photocatalytic Properties of Bismuth molybdate and its Composites" (2017-2023).

2. Ms. Shailaja Mittal – Pursuing

Title "Synthesis and Evaluation of Magnetic Metal oxide Nano-particles and their Composites for Waste Water Treatment."

Research Contribution at Undergraduate and Postgraduate Level

1. **Guided MSc. Student (Ms. Chitra, Amity University)** " under Summer Internship Programme-May-July 2023.

2. Mentored BSc.(Hons) chemistry students for two month project entitled "Functionalized Nano Biopolymer for Designing of Sustainable Crop Protection Formulations"(25 April 2021-24 June 2021).

3. Guided B.Sc. students for project on "**Eco-friendly magnetic bioploymer nanocomposites for removal of heavy metals from waste water" under Summer Internship Programme**-2018-19. (Student participation: Vani Sharma, Yamini Chaddha, Arushi Rawat, Tanisha Singh, Simran Kapoor; students of Chem Hons IInd year). Published work in Vantage: Journal of Thematic Analysis A Multidisciplinary Publication of Centre for Research, Maitreyi College, University of Delhi, April 2020, Volume 1, Issue 1.

4. Guided B.Sc. students for project on "Nano prospectives Aspect of Covid 19" under Summer Internship Programme" . Nanoscale Perspective of Coronavirus", (2020), (Student participation: Aditi Singh, Harshita Sharma, Muskaan, Sakshi Sharma, Stuti Dureja; Students Chemistry Hons IInd year).

Conference Presentations

- Novel Chitosan Derivatives as Potential Drugs Carries Paper Presented (Oral PPt by Students), (Secured Third position), International conference (Virtual Mode), International conference Recent trends in drugs discovery and development International , 08 Oct. 2021.
- Oral Presentation, Online National Conference Recent Advances in Functional Materials (RAFM-2020) organised by Department of Physics, ARSD College, University of Delhi (5-6 November 2020).
- Poster Presentation, India International Science Fest, National Physical Laboratory, New Delhi, Dec. 20-24 2016,
- Oral Presentaion, National Conference "Combating Industrial Pollution For Sustainable Environment – A Fusion Of Industrial and Scientific Efforts" (CIPSE - 2016) Gargi College, University of Delhi 22nd & 23rd September, 2016.
- Poster presentation DU-JAIST Indo-Japan symposim on chemistry of functional molecules/Materials, organized by department of chemistry ,University of Delhi 26-27 Feb. 2016.
- Hema Bhandari, Kabir Rastogi, Veena Choudhary and S.K. Dhawan, "Antistatic Properties of Conducting Polymer Composite based on LDPE and Polyaniline doped with Lignosulphonic acid" –Asian Polymer Association, 2008 (Best Poster Presentation Award).
- Oral presentation-Hema Bhandari, V. Bansal, Veena Choudhary and S.K.Dhawan, "Influence of Reaction Conditions on the Corrosion Inhibition and Antistatic Behaviour of Copolymer of poly(aniline-co-1-amino 2-naphthol-4-sulohonic acid): synthesis and characterization"-ICEP-2008, Jaipur (12-17 Oct.08).
- Oral presentation- Hema Bhandari, S. Singh, V. Choudhary and S.K.Dhawan "Synthesis of Conducting Polymeric Materials for Antistatic Applications" Asia

pacific Academy of Materials and ILTP Workshop on Nano Science and Technology -18-20 Nov.2008 NPL, New Delhi.

- Hema Bhandari, V Choudhary, S.K.Dhawan."Influence of self doped poly (aniline-co-amino-naphthol-sulphonic acid) on corrosion inhibition behaviour for iron in highly acidic medium" RADTECH-INDIA 2009,1-4 Nov.2009. (oral presentation).
- Hema Bhandari, Veena Choudhary, S.K.Dhawan "Development of Highly Adhesive Antifouling and Anticorrosive Nanofiber Network of Conducting Copolymer $-Fe_2O_3$ Composite for Protection of Iron" International conference on "Frontiers of Polymers and Advanced Materials, Macro-2010, Dec 15-17, 2010.(Best Poster Presentation Award).
- Oral Presentaton-Hema Bhandari, Veena Choudhary, S.K.Dhawan Indo-Italian workshop on "frontier of fundamental and industrial electrochemistry "The Challenge of Science for Better World. University of Delhi, Aug.30-31, 2010.

Administrative responsibilities for Maitreyi College/ University of Delhi in last 3 years

- Member of NAAC SSR (2016-2021) July 2020-June 2021.
- Member of Canteen Committee 2020-2021.
- Member of Website Committee 2020-2021.
- Member of the OBE Evaluation Committee, University of Delhi 2020-2022.
- Member of the Robing and Procession Committee the 97th, 98 and 99 Annual Convocation, Delhi University, 27 Feb,2021, 26 Feb 2022, & 25 Feb 2023.
- Member of the Flower and Decoration Committee in the 97th, 98 and 99 Annual Convocation, Delhi University, 27 Feb,2021, 26 Feb 2022, & 25 Feb 2023.
- Member of NAAC SSR Committee, Maitreyi College , 2021-2022.
- Member Computerization Committee, Maitreyi College 2021-2022.
- Organising committee member of International Conference on " Recent trends in drugs discovery and development. (8-9 Oct. 2021).
- Member of Website Maintenance committee, Maitreyi College 2022-2023.
- Member of Committee of Courses, Department of Chemistry, University of Delhi. 2022-2023.

- Worked as Teacher-in-charge of Chemistry Department, Maitreyi College (2023-2024).
- Member of Admission Committee. Maitreyi College (2023-2024).
- Member of Academic Co-Curricular Committee (ACCC), Maitreyi College. 2023-2024.
- Member of Time Table Committee, Maitreyi College , 2023-2024.