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Education

□ **Ph.D** : September 2001-June 2004, International Max Planck Research School (IMPRS) on Biomimetic Systems, Max Planck Institute of Colloids and interfaces, Potsdam, Germany.

Thesis title: Fabrication of porous metal oxides for catalytic applications using templating techniques

□ **M.Sc. (Inorganic Chemistry):** August 1997- June 1999: Department of Chemistry, University of Pune, India

□ **B.Sc. (Chemistry)** August 1994- June 1997 Sir Parashurambhau College, Pune, India.

Professional positions

December 2019- till date : Associate Professor at Department of Materials Science and Metallurgical Engineering, Indian Institute of Technology Hyderabad, Hyderabad, India

December 2011- December 2019: Assistant Professor at Department of Materials Science and Metallurgical Engineering, Indian Institute of Technology Hyderabad, Hyderabad, India

August 2006- February 2011: Postdoctoral Fellow at the Forsyth Institute, Boston, US, till August 2007. Continued the same position at the School of Dental Medicine, University of Pittsburgh, Pittsburgh, US.

August 2004- April 2006: Postdoctoral fellow at the Department of Biomaterials, Max Planck Institute of Colloids and interfaces, Potsdam, Germany.

July 1999-July 2001: Project assistant, the Physical and Materials Chemistry Division, National Chemical Laboratory, Pune.

Research Interests

Nanoparticle synthesis: Synthesis of novel multicomponent oxide (high entropy oxide) and high entropy alloy nanoparticles, their detailed structural analysis and analysis of their functional properties.

Carbon Materials: Generation of nanostructured carbon materials for energy storage applications

Biomaterials: Biomimetic approaches for the generation of materials for superhydrophobic surfaces and coatings

List of Publications and Patents:

Total number of Publications: 44

patents: 3

h-index: 22

Publication¹

1. PEDOT:PSS-bacterial cellulose bilayer actuators: From the movement of ions to deflection. Najathulla BC, Kumar S, Deshpande AS, Khandelwal M. *Polymers for Advanced Technologies*. Published online 2023 (2023). doi:10.1002/pat.6040
2. Effective band gap engineering in multi-principal oxides (CeGdLa-Zr/Hf)O_x by temperature-induced oxygen vacancies. Hu Y, Anandkumar M, Joardar J, Wang X, Deshpande AS, Reddy KM. *Scientific Reports*. 13(1):2362, (2023). doi:10.1038/s41598-023-29477-0
3. TiO₂ Decorated SiO₂ Nanoparticles as Efficient Antibacterial Materials: Enhanced Activity under Low Power UV Light. Mahanta U, Deshpande AS, Khandelwal M. *ChemistrySelect*. 8(4):e202203724, (2023). doi:https://doi.org/10.1002/slct.202203724
4. Biocompatible and antimicrobial multilayer fibrous polymeric wound dressing with optimally embedded silver nanoparticles. Sarviya N, Mahanta U, Dart A, et al. *Applied Surface Science*. 612:155799, (2023). doi:https://doi.org/10.1016/j.apsusc.2022.155799
5. Humidity-Independent Methane Gas Detection in Gd_{0.2}La_{0.2}Ce_{0.2}Hf_{0.2}Zr_{0.2}O₂-based Sensor Using Polynomial Regression Analysis. Naganaboina VR, Bonam S, Anandkumar M, Deshpande AS, Singh SG. *IEEE Electron Device Letters*. Published online 2022:1, (2022). doi:10.1109/LED.2022.3215616
6. Smartphone camera-based micron-scale displacement measurement: development and application in soft actuators. Najathulla BC, Deshpande AS, Khandelwal M. *Instrumentation Science & Technology*. Published online March 22, 2022:1-10, (2022). doi:10.1080/10739149.2022.2053153
7. Single-Phase High-Entropy Oxide Nanoparticles for Wide Dynamic Range Detection of CO₂. Naganaboina VR, Anandkumar M, Deshpande AS, Singh SG. *ACS Applied Nano Materials*. 5(3):4524-4536, (2022). doi:10.1021/acsnm.2c00855
8. PEDOT:PSS/Bacterial Cellulose-based soft actuator under triangle and square wave: Deflection, response and fidelity. Najathulla BC, Deshpande AS, Khandelwal M. *Synthetic Metals*. 286:117053, (2022). doi:10.1016/j.synthmet.2022.117053
9. Single-phase high-entropy oxide-based chemiresistor: Toward selective and sensitive detection of methane gas for real-time applications. Naganaboina VR, Anandkumar M, Deshpande AS, Singh SG. *Sensors and Actuators B: Chemical*. 357:131426, (2022). doi:10.1016/j.snb.2022.131426
10. TiO₂@SiO₂ nanoparticles for methylene blue removal and photocatalytic degradation under natural sunlight and low-power UV light. Mahanta U, Khandelwal M, Deshpande

- AS. *Applied Surface Science*. 576:151745, (2022). doi:10.1016/j.apsusc.2021.151745
11. Sweetcorn husk derived porous carbon with inherent silica for ultrasensitive detection of ovarian cancer in blood plasma.Pandey U, Rani MU, Deshpande AS, Singh SG, Agrawal A. *Electrochimica Acta*. 397:139258, (2021). doi:10.1016/j.electacta.2021.139258
 12. Antimicrobial surfaces: a review of synthetic approaches, applicability and outlook.Mahanta U, Khandelwal M, Deshpande AS. *Journal of Materials Science*. 56(32):17915-17941, (2021). doi:10.1007/s10853-021-06404-0
 13. N-doped MWCNTs from catalyst-free, direct pyrolysis of commercial glue.Damodar D, Mahanta U, Deshpande AS. *Materials Chemistry and Physics*. 262:124319, (2021). doi:10.1016/j.matchemphys.2021.124319
 14. In-situ formation of mesoporous SnO₂@C nanocomposite electrode for supercapacitors.Rani MU, Naresh V, Damodar D, Muduli S, Martha SK, Deshpande AS. *Electrochimica Acta*. 365:137284, (2021). doi:10.1016/j.electacta.2020.137284
 15. Single-phase Gd_{0.2}La_{0.2}Ce_{0.2}Hf_{0.2}Zr_{0.2}O₂ and Gd_{0.2}La_{0.2}Y_{0.2}Hf_{0.2}Zr_{0.2}O₂ nanoparticles as efficient photocatalysts for the reduction of Cr(VI) and degradation of methylene blue dye.Anandkumar M, Lathe A, Palve AM, Deshpande AS. *Journal of Alloys and Compounds*. 850:156716, (2021). doi:10.1016/j.jallcom.2020.156716
 16. Structural and luminescent properties of Eu³⁺ doped multi-principal component Ce_{0.2}Gd_{0.2}Hf_{0.2}La_{0.2}Zr_{0.2}O₂ nanoparticles.Anandkumar M, Bagul PM, Deshpande AS. *Journal of Alloys and Compounds*. 838:155595, (2020). doi:10.1016/j.jallcom.2020.155595
 17. Wood-Derived Carbon Fibers Embedded with SnO_x Nanoparticles as Anode Material for Lithium-Ion Batteries.Revathi J, Jyothirmayi A, Rao TN, Deshpande AS. *Global Challenges*. 4(1):1900048, (2020). doi:10.1002/gch2.201900048
 18. Corn husk derived activated carbon with enhanced electrochemical performance for high-voltage supercapacitors.Usha Rani M, Nanaji K, Rao TN, Deshpande AS. *Journal of Power Sources*. 471:228387, (2020). doi:10.1016/j.jpowsour.2020.228387
 19. Hard carbon derived from sepals of Palmyra palm fruit calyx as an anode for sodium-ion batteries.Damodar D, Ghosh S, Usha Rani M, Martha SK, Deshpande AS. *Journal of Power Sources*. 438:227008, (2019). doi:10.1016/j.jpowsour.2019.227008
 20. Wetting Transition from Lotus Leaf to Rose Petal using Modified Fly Ash.Mahanta U, Khandelwal M, Deshpande AS. *ChemistrySelect*. 4(27):7936-7942, (2019). doi:10.1002/slct.201901535
 21. 3D printable SiO₂ nanoparticle ink for patient specific bone regeneration.Roopavath UK, Soni R, Mahanta U, Deshpande AS, Rath SN. *RSC Advances*. 9(41):23832-23842, (2019). doi:10.1039/C9RA03641E
 22. Low temperature synthesis and characterization of single phase multi-component fluorite oxide nanoparticle sols.Anandkumar M, Bhattacharya S, Deshpande AS. *RSC Advances*.

9(46):26825-26830, (2019). doi:10.1039/C9RA04636D

23. Near-Room-Temperature Synthesis of Sulfonated Carbon Nanoplates and Their Catalytic Application. Damodar D, Kunamalla A, Varkolu M, Maity SK, Deshpande AS. *ACS Sustainable Chemistry & Engineering*. 7(15):12707-12717, (2019). doi:10.1021/acssuschemeng.8b06280
24. Sodium alginate/gelatin with silica nanoparticles a novel hydrogel for 3D printing. Soni R, Roopavath UK, Mahanta U, Deshpande AS, Rath SN. In: Sahulhameedu S, Shakya S, CJ, ed. *AIP Conference Proceedings*. Vol 1966. American Institute of Physics Inc.; 2018:020002. doi:10.1063/1.5038681
25. Nitrogen-doped graphene-like carbon nanosheets from commercial glue: morphology, phase evolution and Li-ion battery performance. Damodar D, Kumar SK, Martha SK, Deshpande AS. *Dalton Transactions*. 47(35):12218-12227, (2018). doi:10.1039/C8DT01787E
26. Primary Structure and Phosphorylation of Dentin Matrix Protein 1 (DMP1) and Dentin Phosphophoryn (DPP) Uniquely Determine Their Role in Biomineralization. Deshpande AS, Fang P-A, Zhang X, Jayaraman T, Sfeir C, Beniash E. *Biomacromolecules*. 12(8):2933-2945, (2011). doi:10.1021/bm2005214
27. Possible role of DMP1 in dentin mineralization. Beniash E, Deshpande AS, Fang PA, Lieb NS, Zhang X, Sfeir CS. *Journal of Structural Biology*. 174(1):100-106, (2011). doi:10.1016/j.jsb.2010.11.013
28. Amelogenin-Collagen Interactions Regulate Calcium Phosphate Mineralization in Vitro. Deshpande AS, Fang P-A, Simmer JP, Margolis HC, Beniash E. *Journal of Biological Chemistry*. 285(25):19277-19287, (2010). doi:10.1074/jbc.M109.079939
29. Bioinspired Synthesis of Mineralized Collagen Fibrils. Deshpande AS, Beniash E. *Crystal Growth & Design*. 8(8):3084-3090, (2008). doi:10.1021/cg800252f
30. Synthesis of mesoporous ceria zirconia beads. Deshpande AS, Niederberger M. *Microporous and Mesoporous Materials*. 101(3):413-418, (2007). doi:10.1016/j.micromeso.2006.11.036
31. Atomic-scale structure of nanocrystalline CeO₂-ZrO₂ oxides by total x-ray diffraction and pair distribution function analysis. Gateshki M, Niederberger M, Deshpande AS, Ren Y, Petkov V. *Journal of Physics: Condensed Matter*. 19(15):156205, (2007). doi:10.1088/0953-8984/19/15/156205
32. Hierarchically Structured Ceramics by High-Precision Nanoparticle Casting of Wood. Deshpande AS, Burgert I, Paris O. *Small*. 2(8-9):994-998, (2006). doi:10.1002/sml.200600203
33. Steam reforming of methanol over Cu/ZrO/CeO catalysts: a kinetic study. MASTALIR A, FRANK B, SZIZYBALSKI A, et al. *Journal of Catalysis*. 230(2):464-475, (2005). doi:10.1016/j.jcat.2004.12.020

34. Titania and Mixed Titania/Aluminum, Gallium, or Indium Oxide Spheres: Sol-Gel/Template Synthesis and Photocatalytic Properties. Deshpande AS, Shchukin DG, Ustinovich E, Antonietti M, Caruso RA. *Advanced Functional Materials*. 15(2):239-245, (2005). doi:10.1002/adfm.200400220
35. Controlled Assembly of Preformed Ceria Nanocrystals into Highly Ordered 3D Nanostructures. Deshpande A, Pinna N, Smarsly B, Antonietti M, Niederberger M. *Small*. 1(3):313-316, (2005). doi:10.1002/sml.200400060
36. Synthesis and Characterization of Stable and Crystalline Ce_{1-x}Zr_xO₂ Nanoparticle Sols. Deshpande AS, Pinna N, Beato P, Antonietti M, Niederberger M. *Chemistry of Materials*. 16(13):2599-2604, (2004). doi:10.1021/cm040155w
37. Synthesis of nanosized Ce_{0.75}Zr_{0.25}O₂ porous powders via an autoignition: glycine nitrate process. Potdar H., Deshpande S., Kholam Y., Deshpande A., Date S. *Materials Letters*. 57(5-6):1066-1071, (2003). doi:10.1016/S0167-577X(02)00932-1
38. A self-sustaining acid-base reaction in semi-aqueous media for synthesis of barium titanyl oxalate leading to BaTiO₃ powders. Kholam Y., Deshpande A., Potdar H., Deshpande S., Date S., Patil A. *Materials Letters*. 55(3):175-181, (2002). doi:10.1016/S0167-577X(01)00642-5
39. Preparation of ceria-zirconia (Ce_{0.75}Zr_{0.25}O₂) powders by microwave-hydrothermal (MH) route. Potdar HS, Deshpande SB, Deshpande AS, et al. *Materials Chemistry and Physics*. 74(3):306-312, (2002). doi:10.1016/S0254-0584(01)00485-0
40. Synthesis of yttria stabilized cubic zirconia (YSZ) powders by microwave-hydrothermal route. Kholam YB, Deshpande AS, Patil AJ, Potdar HS, Deshpande SB, Date SK. *Materials Chemistry and Physics*. 71(3):235-241, (2001). doi:10.1016/S0254-0584(01)00287-5
41. Improved chemical route for quantitative precipitation of lead zirconyl oxalate (PZO) leading to lead zirconate (PZ) powders. Deshpande AS, Kholam YB, Patil AJ, Deshpande SB, Potdar HS, Date SK. *Materials Letters*. 51(2):161-171, (2001). doi:10.1016/S0167-577X(01)00284-1
42. Microwave-hydrothermal synthesis of equi-axed and submicron-sized BaTiO₃ powders. Kholam YB, Deshpande AS, Patil AJ, Potdar HS, Deshpande SB, Date SK. *Materials Chemistry and Physics*. 71(3):304-308, (2001). doi:10.1016/S0254-0584(01)00286-3
43. Simplified chemical route for the synthesis of barium titanyl oxalate (BTO). Potdar HS, Deshpande SB, Deshpande AS, et al. *International Journal of Inorganic Materials*. 3(7):613-623, (2001). doi:10.1016/S1466-6049(01)00168-4
44. Preparation and characterization of strontium zirconate (SrZrO₃) fine powders. Potdar HS, Deshpande SB, Patil AJ, Deshpande AS, Kholam YB, Date SK. *Materials Chemistry and Physics*. 65(2):178-185, (2000). doi:10.1016/S0254-0584(00)00238-8

Patents:

1. Improved process for Wood derived Carbon - Metal oxide composites prepared by nanocasting of wood for electrode materials in lithium ion batteries

Janardhanan Revathi, **Atul Suresh Deshpande**, Tata Narasinga Rao

Indian Pat. Appl. (2016) 201611034531

2. An improved process for the preparation of stable nano silver suspension having antimicrobial activity

Janardhanan Revathi, Nellipudi Satya Moulika, Avvaru Venkata Sai, **Atul Suresh Deshpande**, Karuppiyah Murugan, Neha Yeshwanta Hebalkar, Ravula Vijay, Tata Narasinga Rao, Govindan Sundararajan

Indian Pat. Appl. (2016) 201611027145

3. An improved process for the preparation of barium titanyl oxalate (BTO).

Potdar, H.S., Desphande, S.B., Date, S.K., Kholam, Y.B., **Deshpande, A.S.**, Patil, A.J.,

Indian Pat. Appli.792/DEL/2001, Patent No. 220791.

Recent Talks and conference proceedings

1. **Atul Suresh Deshpande**, Damodar D, M. Usha rani, "Precursor dictated morphology control of nanostructured carbons" (Oral Presentation) **Carbon MEMS: New Horizons, Fourth International Carbon-MEMS Meeting, Hyderabad, December 2018**

Atul Suresh Deshpande, M. Anandkumar, Saswata Bhattachrya, Ranjith Ramadurai, "Entropy Stabilized Multicomponent Oxides: Synthesis and Structural Analysis" (Invited talk) **NMD-ATM 2016, IIT Kanpur, November 2016**

3. M. Anandkumar, **Atul Suresh Deshpande**, Saswata Bhattachrya, Ranjith Ramadurai, "Entropy stabilized rare-earth based oxide: Synthesis and Thermal Stability, (Oral presentation) **MRS fall meeting, November 2016**

4. Raghav Soni, Uday Roopavath, Urbashi Mahanta, **A. S. Deshpande***, S.N.Rath* "Sodium alginate/gelatin with Silica nanoparticles a Novel Hydrogel for 3D-Printing" International Conference on Inventive Research in Material Science and Technology, Coimbatore, India (ICIRMCT 2018), **AIP conference Proceedings, 1966, 020002 (2018)** <https://doi.org/10.1063/1.5038681>

