

CURRICULUM VITAE

Dr. Nirav J. Joshi

Email: nirav.joshi1986@gmail.com

Phone: +55-16988383604

Postdoctoral Researcher
Physics Department
Sao Carlos Institute of Physics
University of Sao Paulo, Brazil

ACADEMIC PROFILE

Ph.D. in **Applied Physics** on “*Studies of Nano-sized High dielectric constant Materials*” from The Maharaja Sayajirao University of Baroda, Vadodara, India in December-2012.

M.Sc. in Applied Physics from Department of Applied Physics, The Maharaja Sayajirao University of Baroda, Vadodara, India in December-2008

B.Sc. in Physics from Department of Physics, The Maharaja Sayajirao University of Baroda, Vadodara, India in October-2006

RESEARCH INTERESTS

Nanomaterial synthesis and characterization, thin films, Micro-fabrication, Gas sensors, Langmuir-Blodgett Thin films, Flexible gas sensors, High-k nano-structured materials.

AWARDS/FELLOWSHIPS/ACCOMPLISHMENTS

- Selected for Postdoctoral Researchers’ Networking Tour (PostDoc-NeT)-2017 fully funded by German funding agency (DAAD) regarding the perspectives in German Material Science and Nanotechnology.
- FAPESP Postdoctoral Research Fellowship, Brazil (2016-2019)
- **Best Patent Award in 2015-2016** from Gujarat Technological University in National Competition on PatenTrack-2015 on patent “**A Process for the Preparation of Nanocrystalline Barium Titanate Powder**”
- **Best R&D Technical Paper for the Year 2012 - 2013** from Electrical Research and Development Association (ERDA) on Technical paper “**Synthesis and Dielectric Behavior of Nano - Scale Barium Titanate**” published in IEEE Transactions on Dielectrics and Electrical Insulation.
- **Best R&D Award for the Year 2010 - 2011** from Electrical Research and Development Association (ERDA) on the patent “**A Process for the Preparation of Nanocrystalline Barium Titanate Powder**”
- **International publication: 20, Book Chapter: 5, Conference Proceedings: 5**

Research and Industrial Experience (>6 years)

IFSC, University of Sao Paulo, Brazil

May 2018- Present

Postdoctoral Researcher

- Synthesis and fabrication of 2D materials-based sensors and biosensors.
- Device fabrication by Photolithography techniques.
- Teaching to the master students and guide them for research project

University of California, Berkeley, USA

May 2017-April 2018

Postdoctoral Researcher

- Nanomaterial-based Heterostructures: Synthesis and their Gas Sensing Properties.
- Room temperature operable, highly selective and sensitive graphene-based gas sensor.
- Device and electrode fabrication by photolithography techniques
- Actively involved in industry sponsored project by Texas Instruments and Midea Inc.
- Guided PhD and Master students in their research project

IFSC, University of Sao Paulo, Brazil

January 2016 - April 2017

Postdoctoral Researcher

- Synthesized binary metal oxide based selective and sensitive ozone gas sensor.
- Fabricated metal oxides heterostructures for gas sensor application.
- Metal Oxide heterostructures for gas sensor application

Chonnam National University, South Korea

March 2014 - June 2014

Research Fellow

- Synthesized and studied metal oxide and surface modified metal oxides to enhance sensor response and selectivity for CO₂ gas sensor.
- Involved in metal oxide-based CO₂ gas sensors for mobile application (LG Sponsored Project)

Bhabha Atomic Research Centre, Mumbai, India

August 2012 - February 2014

Research Associate (Indo-French project)

- Synthesized conducting polymers: polyaniline, polycarbazole, polypyrrole and characterized by different tools.
- Fabrication of conducting polymer on flexible substrate using techniques like electropolymerization, and Langmuir-Blodgett.
- Fabricated flexible sensor which is room temperature operated, highly selective and sensitive to H₂S.
- Guided PhD and Master students in their research project

Electrical Research Development Association (ERDA), India

August 2008 - July 2012

Research Fellow

- Synthesized high-k materials for capacitor application
- BaTiO₃ nano powders were synthesized using sol-gel and hydrothermal method and commercialized.

Teaching Experience (1.8 years)

Shroff S R Rotary Institute of Chemical Technology, Ankleshwar, India March 2015 to December-2015

Assistant Professor (Temporary)

Basic Physics to the Engineering Students on topics like:

- Introduction of dielectric and magnetic materials
- Basics of acoustic and ultrasonic, superconductivity, laser
- Introduction of nanophysics and advanced engineering materials

ITM Vocational University, Vadodara, India

July 2014 to March 2015,

Assistant Professor (Temporary)

Designed and taught basic physics to undergraduate students

- Physics experiments at laboratory level
- Designed curriculum for integrated course for diploma students.
- Topics covered: Interference, diffraction, laser, Fibre Optics, Nanotechnology

HANDS-ON EXPERIENCE OF EXPERIMENTAL FACILITIES

(i) Nanoparticles Preparation

- High Energy Ball Milling
- Autoclave reactor (Hydrothermal) for preparation of nanomaterials
- Different techniques like solvothermal, sol-gel, polymer precursor method

(ii) Thin film preparation

- Langmuir Blodgett Technique (KSV, NIMA)
- Self-assembly using Glove Box (MBRAUN)
- Chemical Vapor Deposition (CVD)
- E-beam evaporation

(iii) Thin film characterization

- Scanning Electron Microscope (JEOL - JSM-6380LV), (Tescan, VEGA MV 2300J/40)
- Energy Dispersive Spectroscopy (EDS)
- X-ray Diffractometer (Bruker D8 Advance)
- Contact angle measuring set up of sessile drop method (SenTech)
- Fourier transform infrared spectroscopy (Bruker, Vertex 80V)
- UV-Vis spectroscopy (JASCO B430)

(iv) Gas sensing measurement

- Design and fabrication of static and dynamic gas sensing unit
- Fabrication of interdigitated electrodes
- Chemiresistive measurements as a function of temperature, gas concentration.
- Electrode preparation by Photolithography

PUBLICATIONS/BOOK CHAPTER

❖ Book Chapter:

1. Anjali Bishnoi, Sunil Kumar, **Nirav Joshi**, Chapter-9 “Wide-Angle X-ray Diffraction (WXRD): Technique for Characterization of Nanomaterials and Polymer Nanocomposites” *Microscopy Methods in Nanomaterials Characterization*, Editors: Sabu Thomas, Raghvendra Kumar Mishra, Ajesh K. Zachariah, **Elsevier Science & Technology Books, Pages 313-337, 2017.**
2. Anjali Bishnoi, Sandeep Rai, **Nirav Joshi***, Sunil Kumar, Chitosan: Antimicrobial and Edible Coatings, *Encyclopedia of Polymeric Applications*, edited by Munmaya Mishra, **Taylor & Francis Group, 2019, Taylor & Francis, Vol. 3, 415-424.**
3. Elsa M. Materón, Renato S. Lima, **Nirav Joshi**, Flavio M. Shimizu, Osvaldo N. Oliveira Jr, Graphene-Based Electrochemical Sensors for Biomolecules, **A. Pandikumar and P. Rameshkumar, Elsevier: 321-336.**
4. Giovana R. Cagnani, **Nirav Joshi***, Flavio M. Shimizu, Carbon Nanotubes-Based Nanocomposite as Photoanode. In *Interfacial Engineering in Functional Materials for Dye-Sensitized Solar Cells* (eds A. Pandikumar, K. Jothivenkatachalam and K. Bhojanaa), **John Wiley & Sons, Inc. 2019:213-229.**
5. Ritu Malik, Vijay K. Tomer, **Nirav Joshi**, Liwei Lin, Nanosensors for monitoring indoor pollution in smart cities, **Elsevier Science & Technology Books, 2019 (In Proof).**
6. **Nirav Joshi***, Maria Luisa Braunger, Flavio Makoto Shimizu, Antonio Riul Jr, Osvaldo Novais Oliveira Jr, Recent advances on 2D Transition Metal Dichalcogenides (TMDs) for gas sensing applications, **Springer, 2019 (Accepted).**
7. Elsa M. Materón, Gisela Ibáñez-Redín, Nirav Joshi, Debora Gonçalves, Osvaldo Novais de Oliveira Jr, Ronaldo Censi Faria, New trends in the analytical detection of pollutants, pesticides and pharmaceutical waste in the environment, **Springer, 2019 (Accepted).**
8. **Nirav Joshi**, Maria Luisa Braunger, Flavio Makoto Shimizu, Antonio Riul Jr, Osvaldo Novais Oliveira Jr, Metal oxide heterostructures for environment monitoring, **Springer, 2019 (Submitted).**
9. Celina M. Miyazaki, **Nirav Joshi**, Osvaldo N. Oliveira Jr, Flavio M. Shimizu, Metal oxides, and Sulphide based biosensors for monitoring and health control, **Springer, 2019 (Submitted).**
10. Prashant Kumar Mishra, Vijay K. Tomer, Ritu Malik, **Nirav Joshi**, Liwei Lin, Hybridized graphitic carbon nitride (g-CN) as high-performance toluene and formaldehyde gas sensor, **Springer, 2019 (Submitted).**
11. **Nirav Joshi**, Maria Luisa Braunger, Flavio Makoto Shimizu, Antonio Riul Jr, Osvaldo Novais Oliveira Jr, Two-dimensional transition metal dichalcogenides for gas sensing applications, **Springer, 2019 (Submitted).**
12. **Nirav Joshi**, Vijay K. Tomer, Ritu Malik, Jing Nie, Recent advances on UV-enhanced oxide nanostructures gas sensors, **Springer, 2019 (Submitted).**
13. Prashant Kumar Mishra, Ritu Malik, Vijay K. Tomer, **Nirav Joshi**, Liwei Lin, Mesoporous silica (SBA-15) based high-performance relative humidity sensors, **Springer, 2019 (Submitted).**
14. **Nirav Joshi**, Flavio Makoto Shimizu, Elsa M. Materon, Osvaldo Novais de Oliveira Jr, Ronaldo Censi Faria, Metal Oxide-Boron Nitride Nanocomposite Modified Electrochemical Sensors for Toxic Chemicals, **Elsevier, 2019 (Submitted).**

❖ Journals:

1. **Nirav Joshi**, Luís F. da Silva, Flavio M. Shimizu, Valmor R. Mastelaro, Jean-Claude M'Peko, Liwei Lin, Osvaldo N. Oliveira Jr, UV-assisted chemiresistors made with gold-modified ZnO nanorods to detect ozone gas at room temperature, *Microchimica Acta (2019) 186: 418.*
2. Jing Nie, Yichuan Wu, Qiyang Huang, **Nirav Joshi**, Ning Li, Xiaofeng Meng, Sunxiang Zheng, Min Zhang, Baoxia Mi and Liwei Lin, Dew point measurement using a carbon-based capacitive sensor with active temperature control, **ACS Appl. Mater. Interfaces 2019, 11, 1, 1699-1705.**
3. Ritu Malik, Vijay K. Tomer, **Nirav Joshi**, Torben Dankwort, Liwei Lin, Lorenz Kienle, Mesoporous silica (KIT-6) assisted synthesis of Au-TiO₂ loaded cubic g-C₃N₄ nanohybrids for Oxidative Decolorization of AzO Dyes and Superior Amine Sensing Performance, *ACS Appl. Mater. Interfaces 2018, 10, 40, 34087-34097.*
4. Yichuan Wu, Qiyang Huang, Jing Nie, Jiaming Liang, **Nirav Joshi**, Takeshi Hayasaka, Shilong Zhao, Min Zhang, Xiaohao Wang, All Carbon-Based Flexible Humidity Sensor, *Journal of Nanoscience and Nanotechnology 2019, 19(8), 5310-5316.*
5. **Nirav Joshi**, Takeshi Hayasaka, Yumeng Liu, Huiliang Liu, Osvaldo N. Oliveira Jr, Liwei Lin, “A review on chemiresistive room temperature gas sensors based on metal oxide nanostructures, graphene and 2D transition metal dichalcogenides”, *Microchimica Acta (2018) 185: 213*
6. Huiliang Liu, Yumeng Liu, Yao Chu, Takeshi Hayasaka, **Nirav Joshi**, Yong Cui, Xiaohao Wang and Liwei Lin, “AC phase sensing of graphene FETs for chemical vapors with fast recovery and minimal baseline drift”, *Sensors and Actuators B 263 (2018) 94-102.*

7. **Nirav Joshi**, Luís F. da Silva, Harsharaj S. Jadhav, Flavio M. Shimizu, Pedro H. Suman, Jean-Claude M'Peko, Marcelo Ornaghi Orlandi, Valmor R. Mastelaro, Osvaldo N. Oliveira Jr, "Yolk-shelled ZnCo₂O₄ microspheres: Surface properties and gas sensing application". *Sensors and Actuators B* **257** (2018) 906–915
8. Abhay Gusain, **Nirav Joshi**, P V Varde, D. K. Aswal, "Flexible NO gas sensor based on conducting polymer Poly[N-9'-heptadecanyl-2,7-carbazole-alt-5,5-(4',7'-di-2-thienyl-2',1',3'-benzothiadiazole)] (PCDTBT)". *Sensors and Actuators B* **239** (2017) 734–745.
9. **Nirav Joshi**, Luís F. da Silva, Harsharaj Jadhav, Jean-Claude M'Peko, Bruno Bassi Millan Torres, Khalifa Aguir, Valmor R. Mastelaro, Osvaldo N. Oliveira Jr, "One-step approach for preparing ozone gas sensors based on hierarchical NiCo₂O₄ structures". *RSC Advances*, **2016**, **6**, 92655-92662.
10. Priya Rakshit, **Nirav Joshi**, Ramesh Jain & Shailesh Shah, Synthesis and Characterization of Polyurea Resin for Dielectric Coating Applications, *Polymer-Plastics Technology and Engineering*, **2016**, **VOL. 55(16)**, 1683–1692.
11. Ashwini Kumar, **Nirav Joshi**, S Samanta, Ajay Singh, AK Debnath, AK Chauhan, Mainak Roy, R Prasad, Kallol Roy, MM Chehimi, DK Aswal, SK Gupta, "Room temperature detection of H₂S by flexible gold–cobalt phthalocyanine heterojunction thin films", *Sensors and Actuators B: Chemical*, **206** (2015) 653-662.
12. **Nirav Joshi**, Vibha Saxena, Ajay singh, Shankar Koiry, A.K. Debnath, Mohamed M. Chehimi, D. K. Aswal and S. K. Gupta, "Flexible H₂S sensor based on gold modified polycarbazole films". *Sensors and Actuators B* **200** (2014) 227–234
13. **N. J. Joshi**, V. Shrinet, A. Pratap, "Influence of Metal Doping on Electrical Properties of Nano Barium Titanate". *Advanced Electrochemistry*, **2:3-8**, 2014.
14. Ahmed Mekki, **Nirav Joshi**, Ajay Singh, Zakaria Salmi, Purushottam Jha, Philippe Decorse, Stephanie Lau, Rachid Mahmoud, Mohamed M. Chehimi, Dinesh K. Aswal and Shiv K. Gupta, "H₂S sensing using in-situ photo-polymerized polyaniline-silver nanocomposite films on flexible substrate" *Organic Electronics*; **15(2014)**, 71-81.
15. Ajay Singh, Zakaria Salmi, **Nirav Joshi**, Purushottam Jha, Philippe Decorse, Stephanie Lau, Mohamed Jouni, M. Chehimi, Dinesh K. Aswal, Shiv K. Gupta, "Electrochemical investigation of free-standing polypyrrole-silver nanocomposite films: substrate free electrode material for supercapacitor". *RSC Advances*; **3: 24567-24575**, 2013.
16. Ajay Singh, Zakaria Salmi, Purushottam Jha, **Nirav Joshi**, Ashwini Kumar, H el ene Lecoq, Philippe Decorse, Stephanie Lau, Dinesh K Aswal, S h i v K Gupta and M M Chehimi, "One step synthesis of highly ordered free standing flexible polypyrrole-silver nanocomposite films at air- water interface by photopolymerisation". *RSC Advances*; **3: 13329-13336**, 2013.
17. Ajay Singh, Ashwini Kumar, Arvind Kumar, S. Samanta, **Nirav Joshi**, Vishal Balouria, A. K. Debnath, R. Prasad, Z. Salmi, M. M. Chehimi, D. K. Aswal, S. K. Gupta, "Bending stress induced improved chemiresistive gas sensing characteristics of flexible cobalt-phthalocyanine thin films". *Applied Physics Letters*; **102:132107**, 2013.
18. Ajay Singh, Zakaria Salmi, **Nirav Joshi**, Purushottam Jha, Ashwini Kumar, H el ene Lecoq, Stephanie Lau, Mohamed M. Chehimi, Dinesh K. Aswal, Shiv K. Gupta, "Photo-induced synthesis of polypyrrole-silver nanocomposite films on N-(3- trimethoxysilylpropyl)pyrrole-modified biaxially oriented polyethylene terephthalate flexible substrates". *RSC Advances*; **3:5506-5523**, 2013.
19. **N. J. Joshi**, G. S. Grewal, V. Shrinet, A. Pratap, T.P. Govindan, "Synthesis and Dielectric Behavior of Nano - Scale Barium Titanate". *IEEE Transactions on Dielectrics and Electrical Insulation*, **19:83-90**, 2012.
20. **N. J. Joshi**, G. S. Grewal, V. Shrinet, A. Pratap, N. J. Buch, "Synthesis and Characterization of Nano Barium Titanate by Hydrothermal Process". *Integrated Ferroelectrics*, **115:142–148**, 2010.

❖ Conference Proceedings

1. **N. J. Joshi**, P.B. Rakshit, G. S. Grewal, V. Shrinet, A. Pratap, "Dielectric properties of modified Nano Barium Titanate-PVB Composites". *AIP Proc.* **1536**, 691 (2013).
2. A. Pratap, **N. J. Joshi**, P.B. Rakshit, G. S. Grewal, V. Shrinet, "Dielectric Behavior of Nano Barium Titanate Filled Polymeric Composites". *International Journal of Modern Physics: Conference Series*, **Vol. 22 (2013) 1–10** (2013).
3. **Nirav Joshi**, Flavio M Shimizu, Iram T Awan, Jean-Claude M'Peko, Valmor R Mastelaro, Osvaldo N Oliveira, Lu s F da Silva, "Ozone sensing properties of nickel phthalocyanine: ZnO nanorod heterostructures". *IEEE Sensors*, **2016**, pp. 1-3.
4. Huiliang Liu, Yao Chu, Yumeng Liu, Takeshi Hayasaka, **Nirav Joshi**, Yong Cui, Xiaohao Wang, Zheng You and Liwei Lin, Selective sensing of chemical vapors using phase spectra detection on CVD graphene FET, *IEEE MEMS*, **2018**, pp. 210-213.

5. Huiliang Liu, Yao Chu, Yumeng Liu, Takeshi Hayasaka, Zhichun Shao, **Nirav Joshi**, Xiaohao Wang, Zheng You and Liwei Lin, Label-free AC Sensing by a Graphene Transistor for 100-ppb Formaldehyde in Air, *IEEE MEMS*, 2019, pp. 607-610.

❖ **Oral presentation in international conferences**

1. **N. J. Joshi**, G. S. Grewal, V. Shrinet, A. Prapat, N. J. Buch, "Synthesis and Characterization of Nano Barium Titanate by Hydrothermal Process". Proc. Intern. Conf. on Electroceramics, Page 167, December 13-17, 2009, Delhi, India.
2. **N. J. Joshi**, G. S. Grewal, V. Shrinet, A. Prapat, T.P. Govindan, "Dielectric behavior of Nano Barium titanate filled polymeric composites". International Conference and Workshop on Nanostructured Ceramics and Nanomaterials, ICWNCN, March 13-16, 2012, Delhi, India
3. **Nirav Joshi**, Luis Fernando da Silva, Flavio Makoto Shimizu, Jean Claude M 'Peko, Valmor Roberto Mastelaro and Osvaldo Novais Oliveira Jr., Nickel Phthalocyanine-ZnO Nanorod Heterostructures for Ozone gas Sensing, XV Brazilian MRS Meeting, 25-29 September 2016, Campinas, SP, Brazil.
4. **Nirav Joshi**, Flavio M Shimizu, Iram T Awan, Jean-Claude M'Peko, Valmor R Mastelaro, Osvaldo N Oliveira, Luís F da Silva, "Ozone sensing properties of nickel phthalocyanine: ZnO nanorod heterostructures". IEEE Sensors Oct. 30 - Nov. 2 2016, Orlando, FL, USA.
5. **Nirav Joshi**, Takeshi Hayasaka, Yumeng Liu, Huiliang Liu, Osvaldo N. Oliveira Jr, Liwei Lin, LOW TEMPERATURE, HIGHLY SENSITIVE NO₂ SENSORS BASED ON ZINC STANNATE MICROCUBES, 7th International Congress on Ceramics, 17-21 June 2018, Foz do Iguacu, Brazil
6. **Nirav Joshi**, Huiliang Liu, Takeshi Hayasaka, Jing Nie, Liwei Lin, Osvaldo N. Oliveira Jr., Low-power, highly selective NO₂ sensor using hierarchical Co₂SnO₄ microspheres, Brazilian Materials Research Society (B-MRS), September 22-26, 2019, Balneário Camboriú, Brazil.

❖ **SCIENTIFIC ASSOCIATIONS**

Guest Editor Special Issue: Journal of Nanoscience and Nanotechnology and Sensor Letters (2019)

Editor of the Book: Functional Nanomaterials - Advances in Gas Sensing Technologies (2019)

Editorial Board Member: Journal of Sensor Technology, Sensors letters

Poster Session Chair at IEEE Sensor 2016 Orlando Florida, USA

Reviewer of ACS Applied Materials & Interfaces, Sensors and actuator B, Nanophotonics, Nature Scientific Reports, Materials Research Bulletin, IEEE Dielectrics and Electrical Insulations, IEEE Sensor, Sensors and actuator A, Journal of Inorganic and Organometallic Polymers and Materials, AIP Advances etc.

❖ **References:**

1. **Dr. Osvaldo Novais de Oliveira Junior**
Professor
São Carlos Institute of Physics
University of São Paulo
Brazil
Email: chu@ifsc.usp.br
2. **Dr. Liwei Lin**
Professor, Department of Mechanical Engineering
University of California at Berkeley
Berkeley, CA, USA
Email: lwlin@berkeley.edu
3. **Dr. D K Aswal**
Director,
National Physical Laboratory (NPL)
New Delhi, India
Email: dkaswal@yahoo.com
4. **Prof. Yogendra Kumar Mishra**
Group leader
Professor WSR,
University of Southern
Denmark
Email: ykm@tf.uni-kiel.de
5. **Dr. Mohamed M. Chehimi**
CNRS research director
Interface, Traitements Organisation et Dynamique des Systems (ITODYS),
Universite Paris Diderot-, and Paris, France.
Email: mmchehimi@yahoo.fr
6. **Dr. Niranjana Ramgir**
Scientific Officer D
Technical Physics Division,
Bhabha Atomic Research Centre,
Trombay, Mumbai –400085, India
Email: niranjana@bhabha.gov.in
7. **Dr. Arun Pratap**
Professor
Applied Physics Department
Faculty of Technology and Engineering
Maharaja Sayajirao University of Baroda.
Vadodara
Email: apratapmsu@yahoo.com

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