

# Curriculum Vitae

## Dr. Omkar V. Rambadey

Postdoctoral Researcher,  
Max Planck Institute for the Structure and Dynamics of Matter  
Hamburg, Germany

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## Profession Summary

A physicist with expertise in condensed matter physics and materials science, specializing in electron-phonon interactions and advanced spectroscopic techniques. My doctoral work involved analytical modeling and experimental investigations across semiconductors and perovskite oxides, complemented by dielectric and magnetic studies. As a postdoctoral researcher, I am expanding my skill set in ultrafast X-ray science and computational methods to explore complex materials and physical phenomena. I am particularly driven to apply cutting-edge experimental tools to solve condensed matter physics oriented problems.

## Work Experience

- 02/2024 – Present • **Postdoctoral Researcher**  
Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany  
Project: *Investigating ultrafast dynamics in strongly correlated materials with time-resolved X-rays*  
PI: Dr. Kartik Ayyer (Ph.D., Cornell University), Computational Nanoscale Imaging Group, Department of Condensed Matter Dynamics, MPSD

## Education and affiliations

- 07/2019 – 12/2023 • **Ph.D. in Physics**  
Department of Physics, Indian Institute of Technology Indore (India)  
Thesis title: *Role of Electronic and Lattice Dynamical Correlation in Semiconductors*  
Adviser: Prof. Pankaj R. Sagdeo
- 07/2017 – 07/2019 • **M.Sc. in Physics (8.46 CGPA)**  
Department of Physics, Mohan Lal Sukhadia University Udaipur, Rajasthan, India
- 07/2014 – 06/2017 • **B.Sc. with Physics, Chemistry, Maths (86.31%)**  
University College of Science, Mohan Lal Sukhadia University Udaipur, Rajasthan, India
- 06/2012–06/2014 • **Higher Secondary (84.8%)**  
Kendriya Vidyalaya No. 1, Pratapnagar, Udaipur, Rajasthan, India  
Central Board of Secondary Education, India
- 07/2011 – 05/2012 • **Secondary (Class 10) (82%)**  
Saraswati Shishu Niketan Secondary School, Udaipur, Rajasthan, India  
Board of Secondary Education Rajasthan, India

## Research Interests

- Ultrafast X-ray studies of correlated electron systems
- Analytical-experimental correlations in semiconductor physics
- *In-situ* Raman and optical spectroscopy of functional materials
- Optical, vibrational, dielectric, and magnetic probes of functional materials
- Transition metal oxides, perovskite oxides/halides, rare-earth orthoferrites
- Materials and devices for energy conversion

## Research Skills

### EXPERIMENTS AND INSTRUMENTS HANDLED

- Optical absorption/ Diffused reflectance spectroscopy
  - UV-Vis-NIR spectrophotometer by Agilent technology
- Raman spectroscopy
  - Horiba LabRam HR Raman spectrometer
- Dielectric measurements
  - Impedance analyzer (by Wayne Kerr electronics)
- X-ray Diffraction
- Scanning Electron Microscopy
- Energy Dispersive X-ray Analysis
- Physical Properties Measurement System

### EXPERIENCE IN THE POSTDOC

- X-ray imaging of particles to study the underlying ultrafast dynamics
- Data analyses algorithm and programming
- Experimental beamtimes at facilities including EuXFEL (Germany), LCLS (USA), Max IV (Sweden)

### SYNTHESIS TECHNIQUES

- Sol gel method
- Solid state reaction
- Hydrothermal synthesis
- RF-magnetron sputtering

## Activities and Awards

### Conferences attended

- Nov 2024 • Ultrafast Dynamic Imaging of Matter (UFDIM) conference, at DESY Hamburg, Germany
- Jun 2024 • 18<sup>th</sup> Ultrafast X-ray Summer School (UXSS), held at Stanford PULSE Institute (SLAC National Accelerator Laboratory), Menlo Park, CA, USA (**Second prize**)
- April 2024 • International Spring School on the Structure and Dynamics of Matter 2024, held at MPI for the Structure and Dynamics of Matter, Hamburg, Germany
- Mar 2023 • Theme Meeting: Spectroscopy using Indus Synchrotron Radiation (SISR-2023), organized by Bhabha Atomic Research Centre (BARC) and Raja Ramanna Centre for Advanced Technology (RRCAT), held at RRCAT, Indore, India
- Jan 2023 • Research and Industrial Conclave 2023, held at Indian Institute of Technology Indore, India (**First runner up in Oral presentation**)
- Dec 2022 • 66<sup>th</sup> Solid State Physics Symposium (Department of Atomic Energy, India) held at Birla Institute of Technology, Ranchi, Jharkhand, India (**Best poster award**)
- Dec 2022 • IX International Conference on Perspectives of Vibrational Spectroscopy at UGC DAE CSR Indore, India (**Poster presentation**)
- Dec 2021 • 65<sup>th</sup> Solid State Physics Symposium (Department of Atomic Energy, India) held online (**Poster presentation**)

### Service

- Reviewer • Communication Physics · Applied Physics Letters

### Academic activities and achievements

- 2019-2023 • Teaching assistant-ship for undergraduate physics courses during PhD.  
Subjects included: Solid state physics, M.Sc. Physics Laboratory, B.Tech. Physics Laboratory
- Feb 2023 • **Best research paper award** under *Institute Research and Technology Award Scheme*, Indian Institute of Technology Indore, India
- July 2019 • **Institute fellowship:** Awarded with fellowship for PhD by Indian Institute of Technology Indore, India
- Mar 2019 • **Qualified GATE-2019:** Graduate Aptitude Test in Engineering in *Physics*

### Extra curricular

- Familiar with basic *Python* and *C*
- Core member of Physics Club, IIT Indore during PhD: Participated in organizing events and delivered talk
- Volunteering with AVANA, IIT Indore: Contributed to teaching students up to the higher secondary level at nearby village schools as part of AVANA: Margdarshan, a social welfare initiative at IIT Indore.

## Activities and Awards (continued)

- Award for Hindi Essay Writing and Poetry (2023): Received recognition during Hindi Pakhwada 2023 organized by the Rajbhasha Hindi Cell, IIT Indore.

## Publications

### Leading work

- 1 O. V. Rambadey<sup>†</sup>, K. Kumar, and P. R. Sagdeo<sup>†</sup>. **Dec. 2024**. “Temperature dependence of disorder sensitivity of phonon modes in finite-gap materials”. In: *Physical Review B* 110.23, p. 235201.  DOI: 10.1103/PhysRevB.110.235201.
- 2 O. V. Rambadey<sup>†</sup>, K. Kumar, R. Nain, A. Kumar, P. R. Sagdeo<sup>†</sup>, et al. **June 2024**. “Shedding light on evolution of Raman line shape with probing laser power: Light-induced perturbation in electron–phonon coupling”. In: *J. Chem. Phys.* 161.3.  DOI: 10.1063/5.0189327.
- 3 O. V. Rambadey, M. Gupta, A. Kumar, and P. R. Sagdeo. **Mar. 2023**. “Tutorial: Analysis of structural disorder on Raman spectra of semiconductors”. In: *J. App. Physics* 133, p. 131101.  DOI: 10.1063/5.0145442.
- 4 O. V. Rambadey, M. Gupta, and P. R. Sagdeo. **Aug. 2022**. “Phonon-Mode-Specific Lattice Dynamical Coupling of Carriers in Semiconductors Using Raman and Optical Spectroscopic Techniques”. In: *Phys. Rev. B* 106.7, p. 075204.  DOI: 10.1103/PhysRevB.106.075204.
- 5 O. V. Rambadey, A. Kumar, K. Kumar, V. Mishra, and P. R. Sagdeo. **Aug. 2022**. “Methodology to Probe Disorder Contribution in Raman Linewidth via Optical Absorption Spectroscopy in Orthoferrite EuFeO<sub>3</sub>”. In: *J. Phys. Chem. C* 126.32, pp. 13946–13956.  DOI: 10.1021/acs.jpcc.2c03347.
- 6 O. V. Rambadey, A. Kumar, and P. R. Sagdeo. **Dec. 2021**. “Investigating the Correlation between the Urbach Energy and Asymmetry Parameter of the Raman Mode in Semiconductors”. In: *Phys. Rev. B* 104.24, p. 245205.  DOI: 10.1103/PhysRevB.104.245205.
- 7 O. V. Rambadey, A. Kumar, A. Sati, and P. R. Sagdeo. **Nov. 2021**. “Exploring the Interrelation between Urbach Energy and Dielectric Constant in Hf-Substituted BaTiO<sub>3</sub>”. In: *ACS Omega* 6.47, pp. 32231–32238.  DOI: 10.1021/acsomega.1c05057.

### Collaborative work

- 1 R. Nain, O. V. Rambadey, and P. R. Sagdeo. **Oct. 2025**. “Interplay of Electron-Phonon Coupling and Lattice Dilation in Band Gap tuning of Gd<sub>x</sub>Ti<sub>1-x</sub>Fe<sub>x</sub>O<sub>5</sub>”. In: *J. Phys. Chem. C* 129.43, pp. 19656–19671.  DOI: 10.1021/acs.jpcc.5c06381.
- 2 M. Gupta, O. V. Rambadey, R. Aggarwal, and P. R. Sagdeo. **June 2025**. “Exploring electronic Raman scattering in La-doped Ce O<sub>2</sub>: Laser energy and power-dependent Raman spectroscopy”. In: *Physical Review B* 111.23, p. 235208.  DOI: 10.1103/stgz-lbd3.
- 3 S. Dutt, O. V. Rambadey, P. Pokhriyal, P. R. Sagdeo, and A. Sagdeo. **May 2025**. “A Comprehensive Study on the Vibrational Spectra of Mixed-Halide Perovskites, MAPb(Br<sub>1-x</sub>Cl<sub>x</sub>)<sub>3</sub>”. In: *The Journal of Physical Chemistry C*.  DOI: 10.1021/acs.jpcc.5c01334.
- 4 K. Kumar, A. Dabkara, P. Ratnawat, O. V. Rambadey, and P. R. Sagdeo. **Mar. 2025**. “Role of Electron-Phonon Interaction in Phase Transition of Zr-Substituted BaTiO<sub>3</sub>”. In: *The Journal of Physical Chemistry C* 129.13, pp. 6352–6361.  DOI: 10.1021/acs.jpcc.5c00377.
- 5 S. Dutt, A. Trivedi, O. V. Rambadey, P. R. Sagdeo, and A. Sagdeo. **Aug. 2024**. “Halide tuning in derivative organic-inorganic perovskites, MAPb(Br<sub>1-X</sub>Cl<sub>X</sub>)<sub>3</sub> (x= 0–1): Exploring structural, optical and vibrational characteristics”. In: *Journal of Materials Science* 59.32, pp. 15449–15468.  DOI: 10.1007/s10853-024-10084-x.
- 6 K. Kumar<sup>‡</sup>, O. V. Rambadey<sup>‡</sup>, and P. R. Sagdeo. **June 2024**. “Contribution of individual phonon to the band gap renormalization in semiconductors”. In: *Physica Scripta* 99.7, p. 075932.  DOI: 10.1088/1402-4896/ad5050.
- 7 K. Kumar, O. V. Rambadey, and P. R. Sagdeo. **Nov. 2023**. “Deconvolution of Phonon-Phonon and Electron-Phonon Interactions from Phonon Line Width in Zr-Substituted BaTiO<sub>3</sub>”. In: *J. Phys. Chem. C* 127.45, p. 22164.  DOI: 10.1021/acs.jpcc.3c05388.
- 8 V. Kadam, A. Anil, T. Sant, S. M. Jejurikar, A. Mandal, [...], O. Rambadey, et al. **Oct. 2023**. “Adequate UV photoemission from Ga<sub>2</sub>O<sub>3</sub>/ZnO/Ga<sub>2</sub>O<sub>3</sub> thin film epistructures”. In: *Optical Materials* 144, p. 114290.  DOI: 10.1016/j.optmat.2023.114290.

- 9 T. Rajgoli, S. Hinde, T. Sant, S. M. Jejurikar, A. Mandal, [...], **O. Rambadey**, et al. **Mar. 2023.** “Non-polar growth of GaN films on polar sapphire substrate using pulsed laser deposition: Investigation of substrate temperature variation on the quality of films”. In: *Physica Status Solidi (b)* 260.6, p. 2200587.  DOI: 10.1002/pssb.202200587.
- 10 S. Dutt, **O. V. Rambadey**, P. R. Sagdeo, and A. Sagdeo. **Feb. 2023.** “Absence of Presumed Ferroelectricity in Methylammonium Lead Chloride Single Crystals Representing Organic-Inorganic Hybrid Perovskites”. In: *Materials Chemistry and Physics* 295, p. 127169.  DOI: 10.1016/j.matchemphys.2022.127169.
- 11 M. Gupta, **O. V. Rambadey**, S. C. Shirbhate, S. Acharya, A. Sagdeo, et al. **Dec. 2022.** “Probing the Signature of Disordering and Delocalization of Oxygen Vacancies and Anti-site Defects in Doped LaAlO<sub>3</sub> Solid Electrolytes”. In: *J. Phys. Chem. C* 126.48, pp. 20251–20262.  DOI: 10.1021/acs.jpcc.2c06473.
- 12 M. D. Joshi, N. K. Kumbhar, **O. V. Rambadey**, P. R. Sagdeo, R. S. Devan, et al. **Oct. 2022.** “Exfoliated Nano-hBN Additives for Enhancing Tribological Performance of ATSP Coatings Deposited on AISI 316L Steel: Role of SMAT Pre-Treatment”. In: *Surface and Coatings Technology* 447, p. 128829.  DOI: 10.1016/j.surfcoat.2022.128829.
- 13 M. Gupta, **O. V. Rambadey**, and P. R. Sagdeo. **Aug. 2022.** “Probing the Effect of R-cation Radii on Structural, Vibrational, Optical, and Dielectric Properties of Rare Earth (R=La, Pr, Nd) Aluminates”. In: *Ceramics International* 48.16, pp. 23072–23080.  DOI: 10.1016/j.ceramint.2022.04.285.
- 14 M. Gupta, S. C. Shirbhate, **O. V. Rambadey**, S. A. Acharya, and P. R. Sagdeo. **Aug. 2022.** “Temperature-Dependent Delocalization of Oxygen Vacancies in La-Substituted CeO<sub>2</sub>”. In: *ACS Appl. Energy Mater.* 5.8, pp. 9759–9769.  DOI: 10.1021/acsaem.2c01442.
- 15 M. Gupta, **O. V. Rambadey**, A. Sagdeo, and P. R. Sagdeo. **June 2022.** “Investigating the Structural, Vibrational, Optical, and Dielectric Properties in Mg-substituted LaAlO<sub>3</sub>”. In: *J Mater Sci: Mater Electron* 33.16, pp. 13352–13366.  DOI: 10.1007/s10854-022-08273-y.
- 16 A. Kumar, **O. V. Rambadey**, H. Rai, and P. R. Sagdeo. **Mar. 2022.** “Role of Laser Excitation Wavelength and Power in the Fano Resonance Scattering in RFe<sub>0.50</sub>Cr<sub>0.50</sub>O<sub>3</sub> (R = Sm, Er, and Eu): A Brief Raman Study”. In: *J. Phys. Chem. C* 126.12, pp. 5403–5410.  DOI: 10.1021/acs.jpcc.1c09537.
- 17 A. Kumar, **O. V. Rambadey**, and P. R. Sagdeo. **Apr. 2021.** “Unorthodox Approach to Realize the Correlation between the Dielectric Constant and Electronic Disorder in Cr-Doped PrFeO<sub>3</sub>”. In: *J. Phys. Chem. C* 125.13, pp. 7378–7383.  DOI: 10.1021/acs.jpcc.1c00203.

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