Dr. Om Prakash, Ph.D.
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Research Experiences-

Specialist (22nd Dec 2021- ….)
Laser Centre, IChF PAN, Warsaw, Poland
Fast molecular dynamics in plasmonic nanocavities, OPUS 20
Project No. 2020/39/B/ST4/01523, 39/2021

Post-doctoral research associate (11th Feb 2019-10th Feb 2021)
Department of Physics, Indian Institute of Technology-Bombay, India
Postdoc research projects:

1) Raman spectroscopic and DFT study of organic-inorganic hybrid perovskite materials.
2) Raman spectroscopic, DFT, and morphological study of organic semiconductors.

Teaching assistant (TA) assignments done for UG (B.Tech.- Eng. Physics) and M.Sc. (Physics): Design and development of the following three optics-based experiments-

1) Mie scattering experimental set-up to estimate particle size of polymer beads (micron-size particles).
2) An Optical setup for measuring the Surface plasmon resonance (SPR) for silver (and gold) film- Application towards biosensing.
3) A set-up to estimate LASER beam characteristics-beam diameter and divergence.

National post-doctoral fellow (01 Aug-30 Nov 18)
Indian Institute of Science, Bangalore, India
(Awarded by the Science and Engineering Research Board, Department of Science and Technology, India)
Project: Development of SERS-based detection technique for pathogens and endotoxins.

Academic Qualifications-

Ph.D. (Physics)	2016	Department of Physics, Banaras Hindu University, India

Title of thesis: Linear, Surface-Enhanced Raman scattering at various substrates and DFT study of biologically important molecules

M. Sc. (Physics)	2010	Banaras Hindu University, India
B. Sc. (H) Physics	2007	Banaras Hindu University, India

Teaching Experiences, Supervising and Mentoring Activities-

1. Teaching assistantship (2013-2015) for PG Diploma in Spectroscopy and B.Sc.-Physics (H) levels in Department of Physics, B.H.U. Varanasi during my Ph.D. period.
2. During my Ph.D., I have assisted/mentored 4 M.Sc. (1 each year) dissertations
3. Teaching assistantship (2019-2021 Feb; 3 semesters) for B.Tech. (Engineering Physics) and M.Sc. (Physics) in the Department of Physics, Indian Institute of Technology-Bombay, Mumbai, India during my postdoc period.

Research Interest, Experimental and Theoretical Expertise-

Experimental Techniques and Interest: Raman Spectroscopy and its derivative techniques (i.e. Resonance Raman spectroscopy, Surface-Enhanced Raman Spectroscopy, Tip-Enhanced Raman Spectroscopy, etc.), SERS-based detection of toxic molecules/ions, pathogens, and endotoxins, IR, UV-visible, and Fluorescence Spectroscopy, Dynamic light scattering and Zeta-potential,
Probe systems: small molecules, macromolecules (e.g., proteins, bacteria etc.), 2D materials, oxide nanomaterials, perovskite materials, organic semiconductors, etc.
Theoretical Techniques: Density functional theory (DFT) based calculations
Chemometrics/Machine Learning Techniques: PCA and LDA for qualitative and quantitative interpretation of Raman spectra.
Synthesis Expertise:

- Metal nanoparticles by chemical reduction, Galvanic replacement reaction, Laser ablation methods.
- Carbon quantum dots synthesis by Chemical oxidation, Hydrothermal, and Microwave methods.

Hands-On Instrumentation and Computational Expertise

- Renishaw and Horiba Raman Microscopy.
- UV-Visible and Fluorescence spectrometer
- FT-IR and ATR Spectrometer
- Zeta-PALS Particle Sizing instrument (Brookhaven Instruments Corp.)
- Gaussian and Gauss View software for DFT based theoretical calculations
- GAR2PED software for vibrational assignments
- Experience in developing optical instruments: UV-vis absorption spectroscopy, Raman spectroscopy, PL spectrometer, and SPR setup

List of Publications-

†(3-as a corresponding/first authorship with additional 5-as first authorship, and remaining are as a co-authorship in collaboration and few are submitted)

1. **Om Prakash***, Excitation wavelength-dependent SERS, and DFT Study to probe Herzberg-Teller Selection Rules on charge-transfer Effect, **J. Chem. Phys. 153, 104703 (2020); https://doi.org/10.1063/5.0022880, (*Corresponding author)**
2. **Om Prakash***, Sanchita Sil, Taru Verma, Siva Umapathy, Direct Detection of Bacteria Using positively-charged Ag/Au bimetallic nanoparticles: A Label-free SERS study coupled with multivariate analysis, **JPC C-2019, https://doi.org/10.1021/acs.jpcc.9b09311, (IF 4.3), (*Corresponding author)**
3. **Om Prakash***, Ranjan K. Singh, Probing Self-associated Intermolecular H-bonding using low-frequency SERS coupled with mid-IR SERS and DFT Study, **PCCP (2019), DOI:10.1039/c9cp03124c (I.F. 3.5), (*Corresponding author)**
4. Travis Novak, **Om Prakash**, AP Tiwari, Seokwoo Jeon, Solution-phase phosphorus substitution for enhanced oxygen evolution reaction in Cu_2WS_4, **RSC Adv., 2019, 9, 234–239.** (I.F. 3.0)
5. **Om Prakash,** S. Kumar, P. Singh, Volker Deckert, S. Chatterjee, A.K. Ghosh, Ranjan K. Singh, Surface-enhanced Raman scattering characteristics of CuO:Mn/Ag heterojunction probed by methyl orange: Effect of Mn^{2+} doping, **Journal Raman Spectroscopy, 2016, 47, 813–818. (IF:2.8)**
6. **Om Prakash,** P. Gautam, S. Kumar, P. Singh, Volker Deckert, Ranjan K. Singh, Surface-enhanced Raman scattering investigation of two novel piperazine carbodithioic acids adsorbed on Ag and ZnO nanoparticles, **RSC Advances,** 2015, 5, 5571. (I.F. 3.0)
7. **Om Prakash,** P. Gautam, Ranjan K. Singh, Probing the orientations of coordination complex molecules onto the surface of ZnO nanoparticles by means of surface-enhanced Raman scattering, UV–vis and DFT methods, **Applied Surface Science** 349 (2015) 657– 664 (IF: 5.15)

8. **Om Prakash,** P. Gautam, R.K. Dani, A. Nandi, N.K. Singh, Ranjan K. Singh, Structural analysis of complexes formed by ethyl 4-phenylthiocarbamoyl piperazine-1-carboxylate with Ni(II), Zn(II) and Cd(II) through spectroscopic and DFT techniques, **Journal of Molecular Structure** 1063 (2014)184–191. (IF: 2.01)
9. **Om Prakash,** S.K. Singh, B. Singh, Ranjan K. Singh, Investigation of coordination properties of isolated adenine to copper metal: A systematic spectroscopic and DFT study, **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy** 112 (2013) 410–416. (IF:2.9)
10. A.P. Tiwari, A. Azam, T. G. Novak, **Om Prakash,** SeokwooJeon, Chemical strain formation through anion substitution in Cu_2WS_4 for efficient electrocatalysis to water dissociation, **J. Mater. Chem. A,** 2018,6, 7786-7793(IF: 10.7)
11. Y. Kim, A.P. Tiwari, **Om Prakash,** Hyoyoung Lee, Activation of Ternary Transition Metal Chalcogenide Basal Planes through Chemical Strain for the Hydrogen Evolution Reaction, **ChemPlusChem,** 2017, 82, 785 – 791(selected as **front cover page** Dec. 2017) (IF:3.2)
12. P. Gautam, **Om Prakash**, R. K. Dani, M. K. Bharty, N. K. Singh, Ranjan K. Singh, Spectra-structure correlation-based study of complex molecules of 1-isonicotinoyl-3- thiosemicarbazide with Ni^{2+}, $Mn^{2+}$and Fe^{3+} using Raman, UV-visible and DFT techniques, **Journal of Molecular Structure,** 2017,1127, 489-497. (IF: 2.01)
13. A.P. Tiwari, D. Kim, Y. Kim, **Om Prakash**, H. Lee, Highly active and stable layered ternary transition metal chalcogenide for hydrogen evolution reaction, **Nano Energy,** 28 (2016) 366–372. (IF:15.45)
14. P. Gautam, **Om Prakash,** R.K. Dani, N.K. Singh, Ranjan K. Singh, Vibrational and quantum chemical investigation of cyclization of thiosemicarbazide group in 1-benzoyl- 4-phenyl-3-thiosemicarbazide, **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy** 132 (2014)278–287.(IF:2.9)
15. R.K. Dani, M.K. Bharty, S.K. Kushawaha, **Om Prakash,** Ranjan K. Singh, N.K. Singh, Ni(II), Cu(II) and Zn(II) complexes of (Z)-N'(1,3,4-thiadiazol-2-yl) acetimidate: synthesis, spectral, electrical conductivity, X-ray diffraction and DFT study, **Polyhedron** 65 (2013)31–41. (IF: 2.06)
16. R.K. Dani, M.K. Bharty, S.K. Kushawaha, **Om Prakash**, Ranjan K. Singh, V. K. Sharma, R.N. Kharwar, N.K. Singh, Syntheses, spectral and structural characterization of trinuclear and mononuclear Zn(II) complexes of N'-benzoyl hydrazine carboperthioate and 5-phenyl-1,3,4-oxadiazole-2-thione: An approach to DFT calculation, antibacterial and thermal studies, **Polyhedron** 81 (2014)261–272. (IF: 2.06)
17. M.K. Bharty, R. K. Dani, P. Nath, A. Bharti, N.K. Singh, **Om Prakash,** Ranjan K. Singh, R.J. Butcher, Syntheses, structural and thermal studies on Zn(II) complexes of 5-aryl- 1,3,4-oxadiazole-2-thione and dithiocarbamates: Antibacterial activity and DFT calculations, **Polyhedron** 98 (2015) 84–95.(IF: 2.06)
18. R.K. Dani, M.K. Bharty, **Om Prakash**, Ranjan K. Singh**,** B. Prashanth, Sanjay Singh, N.K. Singh, Ni(II) and Co(III) complexes of 5-methyl-1,3,4-thiadiazole-2-thiol: syntheses, spectral, structural, thermal analysis, and DFT calculation, **Journal of Coordination Chemistry**, 68, (2015),2666-2681. (IF: 1.703)
19. M.K. Bharty, R.K. Dani, S.K. Kushawaha, **Om Prakash**, Ranjan K. Singh, V. K. Sharma, R.N. Kharwar, N.K. Singh, Synthesis, spectral characterization, thermal behaviour, antibacterial activity and DFT calculation on N0-[bis(methylsulfanyl) methylene]-2- hydroxybenzohydrazide and N0-(4-methoxy benzoyl)-hydrazinecarbodithioic acid ethyl ester, **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy** 145 (2015) 98–109. (IF:2.88)
20. R.K. Dani, M.K. Bharty, S.K. Kushawaha, S. Paswan, **Om Prakash,** Ranjan K. Singh, N.K. Singh, Syntheses, spectral, X-ray and DFT studies of 5-benzyl-N-phenyl-1,3,4 - thiadiazol-2-amine, 2-(5-phenyl-1,3,4-thiadiazol-2-yl) pyridine and 2 -(5-methyl-1,3,4- thiadiazole-2-ylthio)-5-methyl-1,3,4-thiadiazole obtained by Mn(II) catalyzed reactions, **Journal of Molecular Structure** 1054-1055 (2013) 251–261. (IF: 2.01)

Patent:

1. Ria Mukherjee, **Om Prakash**, Dipankar Nandi, Siva Umapathy, A method for ultralow concentration detection of endotoxin: SERS Approach (to be filed)

Prizes/Fellowships/Awards-

1. **INSC Young Researcher Award -2022 (2YRA101)**
2. **CSIR-UGC NET Lectureship award (Physical Science)**-2012 awarded by Council of Scientific & Industrial Research, Human Resource Development Group, (CSIR-HRDG) India.
3. **Graduate Aptitude Test in Engineering (GATE) (Physics)**-2012, conducted by IITs and IISc of India

Conferences/Workshops/Schools/Faculty Development Programs-

1. National level **Faculty Development Program** on **"Applied optics and Photonics"** (10-12 August-2021), Department of Physics, School of Foundational Sciences, Kumaraguru College of Technology, Coimbatore-641049, Tamil Nadu. – participant
2. TEQIP-III SPONSORED **Faculty Development Program** on **RECENT ADVANCES IN MATERIAL CHARACTERIZATION TECHNIQUES**, Coimbatore Institute of Technology, Coimbatore (22 – 26, March 2021) – participant
3. **90 Years of Raman Effect: Current Status and Future Directions**, organized by Indian Institute of Science, Bengaluru, India (27 February– 2 March 2018)-Poster presentation
4. **6th International Conference on Perspectives in Vibrational Spectroscopy (ICOPVS 2016)**, organized by Department of Physics, Lucknow University, India (5–8 November 2016)– Poster presentation
5. International Conference on Frontiers of Spectroscopy, organized by Department of Physics, Banaras Hindu University, India (10 January – 12 January 2015)
6. Winter School on "ADVANCES IN LASER SPECTROSCOPY AND APPLICATIONS" (Under UGC Networking Program) organized by Department of Physics, Banaras Hindu University, India (22 MARCH – 28 MARCH, 2014)
7. 4th International Conference on Perspective in Vibrational Spectroscopy (ICOPVS 2013) (August 6-9, 2013)- Poster presentation
8. Indo-US International Workshop on Spectroscopy: Application to National Security, (IUWSANS-2013), organized by Department of Physics, Banaras Hindu University, India (January 18-20, 2013)-Poster presentation
9. 23rd International Conference on Raman Spectroscopy (ICORS-2012) organized by Indian Institute of Science, Bengaluru, India (August 13-17, 2012)–Poster presentation
10. Winter School on Recent Trends in Physics of Atoms, Molecules, and Lasers (Under UGC Networking Program) organized by Department of Physics, Banaras Hindu University, India (January 9-31, 2011)
11. Summer School on Theoretical Condensed matter physics and Biological System (Under UGC Networking Program) organized by Department of Physics, Banaras Hindu University, India (July 19-August 10, 2010)
12. Recent Trends in Nanotechnology and Materials Characterization "RTNMC–2012" January 12-13, 2012, Prasad Institute of Management and Technology (PIMT), Kanpur Road Banthara, Lucknow, India–Oral presentation

- ## Research expedition led and fund received-

As a principal investigator (PI)
Project reference- PDF/2016/000377
SERB-DST, India- Total released amount- 1860000/- INR (completed 01/08/2016- 31/07/2018)
Project title- Fabrication of Surface-enhanced Raman scattering based detection technique for some macro-biomolecules, cancer, enzyme-drug interaction, and some toxicants
Outcomes as the publication-

- **Om Prakash***, Sanchita Sil, Taru Verma, Siva Umapathy, Direct Detection of Bacteria Using positively-charged Ag/Au bimetallic nanoparticles: A Label-free Surface-enhanced Raman study coupled with multivariate analysis, **JPC C-2019, (IF 4.3), (*Corresponding author)**

Professional References

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Declaration:

I hereby solemnly affirm that the above-mentioned details are true to the best of my knowledge.

Om Prakash

Place: Warsaw, Poland
Date: April 2022