

CURRICULUM VITAE

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CURRENT RESEARCH

- Synthesis of various nanocluster assembled materials of metals and alloys to study its electronic, magnetic, and optical properties and sorption kinetics.
- Study of photoluminescence properties of various nanomaterials
- Surface acoustic wave (SAW) and resistance based hydrogen gas sensors (concentration approximately 1000ppm) with milliseconds response time using nanocluster assembled films of palladium, prepared by various physical/chemical methods.
- Palladium, Magnesium, and Carbon-based hybrid nanocluster assembled structures for high gravimetric capacity hydrogen storage
- Designed and developed a customized nanocluster deposition system, which is about 60-70% cheaper and versatile than commercial systems.
- DFT simulation of materials for self-assembled monolayers, metal organic frameworks, organic molecules etc (IR, Raman, UV-VIS, NMR Spectra, Structural Simulations, potential energy mapping, NLO activity etc)
- The biological activities of pharmaceutical and toxic materials are under investigation using UV-VIS absorption data, and fluorometric assay, which reveals drug-DNA and drug-protein binding characteristics with the supported from FTIR, FT-RAMAN, and molecular simulations.

EXPERIENCE

- **Assistant Professor** (June 2020 to Present)
 Department of Physics, St. John's College, Anchal, Kollam, Kerala
- **Senior Research Associate** (March 2018 to May 2020)
 School of Physics, Indian Institute of Science Education and Research, Thiruvananthapuram, Kerala
- **Institute Post-Doctoral Fellow** (September 2015 to Feb 2018)
 School of Physics, Indian Institute of Science Education and Research, Thiruvananthapuram, Kerala

RESEARCH EXPERTISE

- Experience in Clean Room Experiments
- Nanocluster Deposition System (Nanodep 60. Oxford Applied Research UK)
- Designed and developed a customized nanocluster deposition system
- E-beam evaporation techniques (Tetra, e-flux)
- Arc Melting, Melt spinning and mechanical alloying (Ball Milling)
- Experience in design and development of UHV systems

- Sputtering Techniques (RF and DC), Thermal evaporation, Spin Coating
- Experience on the usage of the glove box(MBRAUN),
- FT-RAMAN(Horiba- LabRAM and Explora Plus), FTIR (Agilent Cary-630),
- UV-Visible Spectrometers, Photoluminescence spectrometer
- X-Ray Diffraction techniques (Inel and Pan analytical)
- Atomic Force Microscopy(AFM) techniques
- FE-SEM(Field Emission Scanning Electron Microscope) and Energy dispersive spectroscopy (EDS)
- Semiconductor Device Analyzer(AgilentB1500A)
- Cryogenic probe station(CRX 4K, Lake Shore Cryotronics)
- Hall Effect measurement System(Nano Magnetics)
- Development of highly reproducible SERS Substrates using metal nanoclusters
- Preparation of Self-Assembled Monolayer (SAM) for device applications
- Crystal growth by the slow evaporation method
- Familiarized with TEM, EPMA, DSC
- Quantum Chemical Computations using Gaussian 09 program package
- Expertise in Origin Lab, Basic knowledge in LabVIEW, and NI Multisim.

ACADEMIC QUALIFICATION PROFILE

➤ **Doctor of Philosophy (PhD-Physics) - 2015**

Manonmanium Sundaranar University, India

Area of Specialization: **Nanotechnology, Material Science, Condensed Matter Physics**

Thesis Title: “Electronic transport and magnetic properties of nanocluster films and nano-phase alloys”.

Visiting Research Scholar: School of Physics, University of Hyderabad 2012-2015

➤ **Master of Science (M.Sc. Physics)**

Bharathidasan University, India - **CGPA-7/10 with A+ Grade**

Thesis Title: “Synthesis and characterization of Nano-crystalline soft magnetic materials”

➤ **Bachelor of Science (B.Sc. Physics)**

Manonmanium Sundaranar University, India -**First class**

➤ **IELTS Over all band score 6.5/9 (2010)**

PROJECTS UNDER INVESTIGATION

- Design and development of a customized nanocluster deposition system to study the particle size dependence on photoluminescence properties of nano-cluster assembled materials(Submitted to DST SERB – Core Research Grant Scheme **2021** for financial assistance)
- Palladium, Magnesium, and Carbon-based hybrid nanocluster structures for high gravimetric capacity hydrogen storage(Funded by Department of Science and Technology (DST), Govt. of India for Funding-**2019**)
- Development of solid-state hybrid hydrogen storage devices using palladium and magnesium nanoclusters (Funded by Indian Space Research Organization (ISRO) through Sponsored Research programme-**2018**)

- Development of hydrogen sensors for extended range of temperatures from 150K to 300K using 2D nanocluster assembled films of palladium(resistivity and SAW-based) (Funded by Indian Space Research Organization (ISRO) through Sponsored Research programme-**2016**)
- Study of the origin of superconductivity using size-controlled nanocluster assembled films of metals like niobium, lead, aluminum, etc. (Funded by Department of Science and Technology (DST), Govt. of India-**2016**)

PROJECT WORKS INVESTIGATED

- Vibrational Spectral Analysis of Materials for Self-Assembled Monolayers /Nano Films Using FT-IR, Raman, and SERS Spectra and Quantum Chemical Computations. (Funded by University Grants Commission, Govt. of India)
- Development of Ultra-Sensitive SERS substrates using nanocluster films for biological applications such as trace detection of pesticides (Funded by Department of Atomic Energy – Govt. of India)
- Synthesis and characterization of “Nanocrystalline Soft Magnetic Materials,” carried out at Materials Science Division of Bhabha Atomic Research Centre, Mumbai. (Masters Project)
- Growth and Characterizations of BTCC(Bis- Thiourea Cadmium Chloride) doped with L- glutamine. (B.Sc. Project)

LIST OF PATENTS

1. A chemiresistive hydrogen sensor and a method there off (Filed application for Indian Patent , Application number 202041035199)

LIST OF PUBLICATIONS

Manuscripts under review/preparation

1. **Praveen S. G.**, C. Bansal, , D. Jaiswal-Nagar “*Electrical transport in a random quasi 2D assembly of Ag nanoclusters*”(Manuscript under preparation)
2. Adithya Jayakumar, **Praveen S G**, VinayakKamble D. Jaiswal-Nagar “*The study of sorption and desorption kinetics of hydrogen gas in ultra-thin films of palladium*” (Manuscript under preparation)
3. Adithya Jayakumar, **Praveen S G**, Gaana K, VinayakKamble D. Jaiswal-Nagar “*Palladium, Magnesium metal nanoclusters based hybrid layered structures for high gravimetric capacity hydrogen storage*” (Manuscript under preparation)

Published research articles

4. Christina E. Antony, Gaana K., **Praveen S. G.**, Adithya Jayakumar, Akshay Yadav, Nikhil S. Sivakumar, Niranjana Kamath, Suma M. N., Vinayak B. Kamble, and Deepshikha Jaiswal-Nagar “*Polyvinylpyrrolidone-Stabilized Palladium Nanocrystals as Chemiresistive Sensors for Low-Concentration Hydrogen Gas Detection*” ACS Appl. Nano Mater. 2021, 4, 2, 1643–1653, (2021)
<https://doi.org/10.1021/acsnm.0c03109>
5. George Mathew Sebastian Francis Neeraj Kumar Rajak, **Sarojini Gopinathan Praveen Chakkalal Vardunny Tomy Deepshikha Jaiswal-Nagar** A simple synthesis method for growing single crystals of a copper coordination polymer [Cu(C₂O₄)(4-aminopyridine)₂(H₂O)]_n, and its theoretical and physical properties studies Volume56, Issue2 (2021)2000124

6. **Praveen S.G.**, C.Bansal, D. Jaiswal-Nagar “Inter-cluster separation induced change in charge transport mechanism in Ni₄₀Pd₆₀ nanoclusters” (**Nature) Sci. Rep** 9, 7513 (2019)
7. Dharmendra K. Singh, **Praveen S. G.**, Adithya Jayakumar, Suma M. N, Vinayak B. Kamble, J. Mitra and D. Jaiswal-Nagar “Thickness induced metal to insulator charge transport and unusual hydrogen response in granular palladium nanofilms” *Phys. Chem. Chem. Phys.*,22, 27861-27872(2020)
8. S. R. Rajina, **S. G. Praveen**, T. S. Xavier, Peter T. M. Kenny, and J. Binoy “Spectroscopic investigations of the interaction of BSA and DNA with the anticancer drug, N-(6-ferrocenyl-2-naphthoyl) glycine alanine ethyl ester (FNGAEE)” *AIP Conference Proceedings* 2220, 070008 (2020)
9. D.E. Nimmi , Geethu Sudhi , **S.G. Praveen** , J. Binoy *Vibrational spectroscopic investigations and biological activity of toxic material amitraz*, *Materials Today: Proceedings*, <https://doi.org/10.1016/j.matpr.2020.01.404>
10. Geethu Sudhi, **S. G. Praveen**, T. S. Xavier, Peter T. M. Kenny, and J. Binoy “*Experimental and theoretical investigations of vibrational spectrum and biological activity of dichlorvos*” *AIP Conference Proceedings* 2220, 070007 (2020)
11. Sindhu P S, Nimmi D E, GeethuSudhi,Abhilash Kumar R G, DhaneshThomas,Chandini Sam S P, **Praveen S G**, J Binoy, The DFT Based Spectral Investigations and Bioactivity of Amprenavir:Materials Today: Proceedings, <https://doi.org/10.1016/j.matpr.2019.10.005>
12. Seema Awasthi, **Praveen S G**, A. Rajanikanth, C. Bansal “Current-Voltage characteristics of electrochemically synthesized multi-layer grapheme with polyaniline” *Journal of Science: Advanced Materials and Devices Volume 3, 1(2018) 37-43*.
13. M. Thairiyaraja, G. Arivazhagan, **S. G. Praveen**, K. Kirubavathi and K. Selvaraju et al “Growth and characterization of 2-Amino-5-bromopyridinium-4-hydroxybenzoate crystals for nonlinear optical and antioxidant applications” *Journal of Nonlinear Optical Physics & Materials* Vol. 27, No. 1 (2018) 1850002, 1-16.
14. GeethuSudhi, S R Rajina , **S G Praveen**, T S Xavier, Peter T M Kenny, D Jaiswal-Nagar, J. Binoy, “Investigations of Vibrational Spectra and Bioactivity Of Novel Anticancer Drug N-(6-Ferrocenyl-2-Naphthoyl)-Gamma-Amino Butyric Acid Ethyl Ester”*SpectrochimicaActa Part A: Molecular and Biomolecular Spectroscopy* 185(2017,)234-244
15. P Bhaskaran, M Vimalan, P Anandan, G Bakiaraj, K Kirubavathi ,**S G Praveen** and K Selvaraju “Studies on an L-leucinehydriodidesemiorganic crystal for frequency conversion applications” 2016 *Mater. Res. Express* 3, 035101
16. GeethuSudhi, S.R. Rajina, **S.G. Praveen**, T.S. Xavier, Peter T.M. Kenny,J. Binoy “*The Electron Transport Mechanism in Ester and its Influence on Bioactivity in the Anticancer Drug N-(6Ferrocenyl-2-Naphthoyl)-L-Alanine-Glycine Ethyl Ester(FNLAGEE)* (*AIP Conf. Proc.* 1953, 080023-1–080023-5)
17. D.E. Nimmi,S.P.Chandhini Sam, **S.G. Praveen**,J. Binoy “DFT based Vibrational Spectroscopic Investigations and Biological Activity of Toxic Material Monocrotophos” (*AIP Conf. Proc.* 1953, 080029-1–080029-5)
18. M.Parvathy,M.S.Gopika,B.L.BincyMary,D.E.Nimmi,**S.G.Praveen**,J.Binoy“*FTIR Spectral Investigations of Toxic Material Dibrom using DFT*” (*AIP Conf. Proc.* 1953, 080040-1–080040-4)
19. S.R.Rajina,GeethuSudhi,P.Austin,**S.G.Praveen**,T.S.Xavier,PeterT.M.Kenny,J.Binoy *Multispectroscopic Investigation of the Interaction of BSA and DNA with the anticancer drug,N-(6-ferrocenyl-2-naphthoyl)-gamma-amino butyric acid Methyl ester*” (*AIP Conf. Proc.* 1953, 080027-1–080027-4)
20. C.Bansal,**Praveen S.G.**, J.T.T. Kumaran, Ashok Chatterjee. “Inter-cluster distance dependence of electrical conduction in nanocluster assembled films of silver: a new paradigm for designing of nanostructures” (**Nature)Sci. Rep.** 5, 7685, (2015).

21. M.N.AudlineJini, J.T.T.Kumaran, A.Dickson Benjamin, **S.G.Praveen** "Density Functional Theory and Natural Bond Order analysis of isobutyl trimethoxysilane" *Elixir Vib. Spec.* 82 (2015) 32425-32432
22. M.N.AudlineJini, J.T.T.Kumaran, A.Dickson Benjamin, **S.G.Praveen** "Vibrational spectral analysis of TCHS used in SAM and formation dynamics" *IJCPS* Vol. 4, No. 3, 2015
23. M.N.AudlineJini, J.T.T.Kumaran, A.Dickson Benjamin, **S.G.Praveen** "The Vibrational Spectra of Trichlorocyclohexylsilane and Formation of Self Assembled Monolayer" *IJRSET* 3, 11 (2014) 17195-17199.
24. **Praveen S.G.**, J Binoy, J.T.T. Kumaran, C.Bansal, AudlineJini M.N.,V.S. Jayakumar "Rotation Dependent Si Hyperconjugation in Self Assembly Material p- Tolytrichlorosilane(PTCS) and Formation of SAM" *Journal of Molecular Structure* 1064 (2014) 81–87.
25. Subramanian Balachandran, **SarojiniGopinathan Praveen**, RengasamyVelmurugan and MeenakshisundaramSwaminathan "Facile fabrication of highly efficient, reusable heterostructured Ag–ZnO–CdO and its twin applications of dye degradation under natural sunlight and self-cleaning " *RSC Adv.*,2014,4, 4353–4362.

Conference Proceedings

26. **Praveen S G**, D Jaiswal Nagar,Aditya Jayakumar ,Gaana K " *Palladium, Magnesium, and Carbon-based hybrid nanocluster structures for high gravimetric capacity hydrogen storage*" Industry Academia Conclave on Hydrogen and Fuel Cells, IISER Thiruvananthapuram ,February 2020
27. GauthamMitra,**Praveen S G**, Joy Mitra "Electrical transport in quasi 2d assembly of gold nanoclusters" International conference on nanomaterials and nanotechnology (ICNANO) VBRI Press 2017 **(Received Best Poster award)**
28. **Praveen S. G.**, C. Bansal "Electrical transport in a random quasi 2D assembly of Ag nanoclusters", Nanoparticle assembly: From fundamental to applications, January 2016, **Faraday Discussions Royal Society of Chemistry**, London.
29. GeethuSudhi, S.R. Rajina, **S.G. Praveen**, T.S. Xavier, Peter T.M. Kenny,J. Binoy"The Electron Transport Mechanism in Ester and its Influence on Bioactivity in the Anticancer Drug N-(6Ferrocenyl-2-Naphthoyl)-L-Alanine-Glycine Ethyl Ester(FNLAGEE) (*AIP Conf. Proc.* 1953, 080023-1–080023-5)
30. D.E. Nimmi,S.P.Chandhini Sam,**S.G. Praveen**,J. Binoy "DFT based Vibrational Spectroscopic Investigations and Biological Activity of Toxic Material Monocrotophos" (*AIP Conf. Proc.* 1953, 080029-1–080029-5)
31. M.Parvathy,M.S.Gopika,B.L.BincyMary,D.E.Nimmi,**S.G.Praveen**,J.Binoy"FTIR Spectral Investigations of Toxic Material Dibrom using DFT" (*AIP Conf. Proc.* 1953, 080040-1–080040-4)
32. S.R.Rajina,GeethuSudhi,P.Austin,**S.G.Praveen**,T.S.Xavier,PeterT.M.Kenny,J.Binoy Multispectroscopic Investigation of the Interaction of BSA and DNA with the anticancer drug,N-(6-ferrocenyl-2-naphthoyl)-gamma-amino butyric acid Methyl ester" (*AIP Conf. Proc.* 1953, 080027-1–080027-4)
33. Neeraj K. Rajak, Trupti S. Gaikwad, AmruthaMukundan, Manju P, A. Sundaresan, A. Thamizhavel, ManojRaamaVarma, **Praveen S. G.** and D. Jaiswal-Nagar "Growth of a high temperature superconductor BSCCO by self-fluxmethod using regrowth and a pressure technique" Institute for Plasma Research, India.
34. **Praveen S.G.**, C.Bansal and D. Jaiswal-Nagar " Electronic transport studies of quasi 2D assembly of Ni₄₀Pd₆₀ alloy nanoclusters" Presented in International Symposium on Clusters, Cluster-Assemblies and Nanomaterials (ISCAN-2016),Indian Institute of Science Education and Research, Thiruvananthapuram.

35. S R Rajina , GeethuSudhi, **S G Praveen**,JBinoy, Peter T M Kenny etal FT IR and FT Raman Spectroscopic Investigations of Anticancer drug: N-(6-ferrocenyl-2-naphthoyl)-gamma-amino butyric acid methyl ester (FNGgABME), **ICOPVS -2016**, Lucknow.
36. GeethuSudhi, S R Rajina , **S G Praveen**, T S Xavier,JBinoy, Peter T M Kenny etal DFT Based Vibrational Spectral Analysis and Biological Activity of N-(6-Ferrocenyl-2-Napthoyl)-Glycine-Glycine Methyl Ester(FNGGME),), **ICOPVS -2016**, Lucknow, India.
37. GeethuSudhi, S R Rajina , **S G Praveen**, T S Xavier,JBinoy, Peter T M Kenny etal DFT Based Vibrational Spectral Analysis and Biological Activity of N-(6- Ferrocenyl-2- Napthoyl)-Glycine-Glycine Methyl Ester(FNGGME)), **ICOPVS -2016**, Lucknow, India
38. GeethuSudhi, S R Rajina , **S G Praveen**, T S Xavier,JBinoy, Peter T M Kenny etal Vibrational Spectral Investigation And Anticancer Activity Of N-(6- Ferrocenyl-2- Napthoyl)-Glycine- D-Alanine Methyl Ester (FNGdAME) **ICOPVS -2016**, Lucknow, India
39. **Praveen S. G.**, C. Bansal “*Observation of percolation behavior in 2-dimensional assembled films of Ag metal nanoclusters and unusual temperature dependent transport properties*” Frontiers in Physics (FIP 2013) organized by University of Hyderabad, India. **(Received Best Poster award)**
40. AudlineJini M.N., Dickson Benjamin A., J T TKumaran, **S.G. Praveen**, “ Vibrational spectral analysis and formation of SAM of Ethoxytrimethylsilane(ETMS)”. Advances in material science held at M.S. University, Tirunelveli.September 29-30. 2014 (ISBN 978-93-81402-16-0).
41. M.N.AudlineJini, J.T.T.Kumaran, A.Dickson Benjamin, **S.G.Praveen**“ *DFT and NBO analysis of ethoxytrimethylesilane and formation of SAM*” National conference on Quantum chemistry 2014 held at NMCC, Marthandam , Kanyakumari.India.
42. M.N.AudlineJini, J.T.T.Kumaran, A.Dickson Benjamin, **S.G.Praveen**“*Vibrational spectral analysis of isobutyletrimethoxysilane and formation of SAM*” National Conference on material science held at Sri Ayyappa College Nagercoil, India
43. **Praveen S.G.**, J. Binoy, J. ThampiThankaKumarana, RajuBotta, C.Bansal and V.S. Jayakumar, “*NLO Activity in Self Assembly Material, p-Tolyltrichlorosilane (PTCS): A Vibrational Spectral Study*” International conference on raman spectroscopy (**ICORS-2012**), Organized by Indian Institute of Science, Bangalore, India.
44. J Binoy , **S G Praveen** , M.K.Marchewka and V S Jayakumar“*FT Raman and FT IR Spectral Analysis of Piperazinium Nitrate Crystal sing DFT*”International conference on raman spectroscopy (ICORS-2012), Organized by Indian Institute of Science, Bangalore, India.
45. V.R. Suresh Kumar, S. D. D.Roy,JBinoy , **S G Praveen** , M.K.Marchewka and V S Jayakumar“*FT-Raman and FTIR spectral analysis and ab initio calculations of the NLO crystal Bismelaminiumsulphatedihydrate (BMSD)*”International conference on raman spectroscopy (ICORS-2012), Organized by Indian Institute of Science, Bangalore, India.
46. **Praveen S.G**, J. Binoy, J. ThampiThankaKumaran, M.K. Marchewka and V.S. Jayakumar“*The Vibrational Analysis Of MelaminiumCation In Melaminium Benzoate Dihydrate : A DFT Study*” 20th DAE- BRNS National Laser Symposium (NLS-20 ,2011), Organized by Anna University Chennai, India.
47. **Praveen S.G**, D.Surendiran, K. Kirupavathi, K. Selvaraju “*Growth and characterization of Pure and L – Glutamine doped BTCC Crystals*”Published in National Symposium on “NLO Crystals and Modeling in Crystal Growth” held at Anna University, India.
48. **Praveen S.G.**,S.Vinu,KCBright,Freeda “*Growth and characterization of B.T.C.C. doped with glutamine*” ,Published in a National level Conference held at South Travencore Hindu College, India.

Oral/Invited Lectures

1. **Praveen S.G.**, C. Bansal, Ashok Chatterjee “*Conductivity percolation in 2-dimensional nanocluster assembled films of silver and unusual temperature dependent transport properties*” Andhra Pradesh Science Congress organized by A.P. Academy of Sciences and University of Hyderabad, India.
2. **Praveen S.G.**, C. Bansal, J.T.T. Kumaran, Ashok Chatterjee “Dependence of inter-cluster separation on electrical conductivity of quasi-2D nanocluster assembled films of Ag: A new paradigm for designing of nanostructures” Indian Institute of Science Education and Research (IISER-TVM), Trivandrum. India
3. **Praveen S.G.**, “Electronic transport and magnetic properties of random quasi-2D assembly of nanoclusters” Indian Institute of Science Education and Research (IISER-TVM), Trivandrum. India
4. **Praveen SG** (A walk through nanoclusters- National seminar on experimental and theoretical physics 2016) Govt. Women’s College Trivandrum India.
5. **Praveen SG** An overview of Novel hydrogen gas sensor based on 2D assembly of Pd nanoclusters - (Star College Scheme, Ministry of Science and technology, Govt. of India, March- 2017) St. John’s College Anchal, Kollam
6. **Praveen S G**, Various physical properties of nanocluster assembled films of Au, Ag, Pd, NiPd (Orientation programme of Malankara Catholic College Mariagiri July 2018)

FELLOWSHIPS AND AWARDS

- ✓ **Associate Member Royal Society of Chemistry UK (Awarded in November 2016)**
- ✓ **Early Career Research Member, Optical Society of America (Since Jan 2018)**
- ✓ Postdoctoral Research Fellowship – Indian Institute of Science Education and Research, Thiruvananthapuram (August 2015 – 2018)
- ✓ Senior Research Fellowship – Department of Atomic Energy, BRNS, India (April 2014- June 2015)
- ✓ Junior Research Fellowship – Department of Atomic Energy, BRNS, India (2012 – 2014)
- ✓ Research Fellow- University Grants Commission, India (2010-2012)

REFERENCES

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