

CURRICULUM VITAE



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Assistant Professor



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OBJECTIVE

To establish myself as a distinguished and venerable faculty and researcher in the field of condensed matter Physics.

Educational Qualifications

| Examinations/Degree | Board/University |
|---|--------------------------------|
| High School | UP Board |
| Intermediate | UP Board |
| B.Sc. | University of Allahabad |
| M. Sc. (Physics) | IIT Indore |
| Ph. D. (Defects Driven Ferromagnetism in Semiconducting Materials) | IIT Delhi |

Research Activities/ Research Experience

Ph.D. Thesis Title: Defects Mediated Ferromagnetism in semiconducting materials (ZnO, GaN and MoS₂)

My thesis work can be broadly described as follows.

(i) **Thin film deposition of ZnO using DC magnetron sputtering and their magnetic behavior after annealing in H₂-atmosphere.**

The thin films of ZnO have been grown using DC magnetron sputtering in oxygen plasma and the films have been post annealed in hydrogen atmosphere. The effect of multicentered bond of hydrogen with ZnO in the ferromagnetic properties has been studied and has been nicely correlated with its electronic structure.

(ii) **Structural, optical and magnetic behavior of ion implanted GaN films.**

The modification of structural, optical and magnetic properties has been studied in 500 keV Xe ions implanted GaN thick films while a systematic tuning of ferromagnetic behavior has been observed in 50 keV N ions implanted GaN films and a very nice correlation has been observed with its electronic structure.

(iii) **Magnetic properties Xe ions irradiated MoS₂ films.**

The MoS₂ films have been prepared using chemical vapor deposition (CVD) technique and implanted with 300 keV Xe ions. A comparative study of magnetic behavior of both set of films has been carried out.

M.Sc. Project Title: “Structural, optical, dielectric, and magneto-dielectric studies on Fe-doped LaGaO₃”.

My M.Sc. project work can be broadly described as follows.

(i) **Preparation of Fe-doped LaGaO₃ samples and to study their structural and optical properties.**

Fe-doped LaGaO₃ samples with different Fe concentration have been prepared by standard solid state reaction method and the tuning of the band gap with Fe concentration has been reported. Vegard’s law has been verified, which shows a very good correlation between structural and optical behavior.

(ii) **Preparation of Fe-doped LaGaO₃ samples and to study their structural, dielectric and magnetodielectric properties.**

Fe-doped LaGaO₃ samples with different Fe concentration have been prepared by standard solid state reaction method and room temperature frequency dependent magneto-dielectric properties have been reported.

Research Experience

- ✓ **2018-22** **Senior Research Fellow** at Department of Physics, IIT Delhi
- ✓ **2016-18** **Junior Research Fellow** at Department of Physics, IIT Delhi
- ✓ **2015-16** **M.Sc. project student** at Department of Physics, IIT Indore

Major Research Thrusts

- ❖ **Synthesis, Ion/charge transportation, optoelectronic and magnetic properties** of GaN, ZnO and MoS₂.
- ❖ **Advanced spectroscopy, microscopy, magnetometry, and electrical transport** of **low dimensional & nanostructured** materials.

Publications

[1] **Preetam Singh *et. al.***; Ferromagnetic behavior Xe ion implanted MoS₂ films. (**Under Review**)

[2] **Preetam Singh**, Vikash Mishra, Sajal Barman, Mohammad Balal, Sudipta Roy Barman, Arvind Singh, Sunil Kumar, Renjith Ramachandran, Pankaj Srivastava, Santanu Ghosh; Role of H-bond along with oxygen and zinc vacancies in the enhancement of ferromagnetic behavior of ZnO films: An experimental and first principle-based study. **J. of Alloys and Comp.** **889** (2021), 161663

[3] **Preetam Singh**, Santanu Ghosh, Vikash Mishra, Sajal Barman, Sudipta Roy Barman, Arvind Singh, Sunil Kumar, Zichao Li, Ulrich Kentsch, Pankaj Srivastava; Tuning of ferromagnetic behavior of GaN films by N ion implantation: An experimental and first principle-based study. **J. of Mag. and Mag. Mat.** **523** (2021), 167630

[4]. **Preetam Singh**, Santanu Ghosh, Arvind Singh, Sunil Kumar, Sunil Ojha and Pankaj Srivastava; Defect mediated modification of structural, optical and magnetic properties of Xe³⁺ ions irradiated GaN/sapphire films. **Nuc. Instr. and Methods in Physics Research B** **466** (2020), 61

[5]. **Preetam Singh**, Indrani Choudhuri, Hari Mohan Rai, Vikash Mishra, Rajesh Kumar, Biswarup Pathak, Archana Sagdeo, PR Sagdeo; **RSC Advances** **6** (102), 100230

[6]. Hari Mohan Rai, **Preetam Singh**, Shailendra K Saxena, Vikash Mishra, M Kamal Warshi, Rajesh Kumar, Parasmani Rajput, Archana Sagdeo, Indrani Choudhuri, Biswarup Pathak, Pankaj R Sagdeo; **Inorganic Chemistry** **56** (7), 3809

[7]. PR Sagdeo, **Preetam Singh**, Hari Mohan Rai, Rajesh Kumar, Archana Sagdeo, Parasmani Rajput; Optical bandgap and bowing parameter for Fe doped LaGaO₃. **arXiv:1603.04961**

Conferences, Workshops & Seminars

[1] Poster presentation in “1st International Conference on Thin Films and Nanotechnology- Knowledge, Leadership and commercialization (ICTN-KLC 2021)” organized by Thin Film Laboratory, Department of Physics, IIT Delhi in virtual mode (**special mention**).

[2] Poster presentation at “European Materials Research Society (E-MRS) 2021 Spring Meeting”, virtual conference.

Title: Role of H-bond along with oxygen and zinc vacancy in the enhancement of ferromagnetic behavior of ZnO films.

[3] Oral presentation at “4th Departmental Symposium on Advances in Physics-2020”, Indian Institute of Technology Delhi, New Delhi, India in virtual mode.

[4] Poster presentation in the international conference on “Ion Beams In Materials Engineering and Characterization (IBMEC)-2020” organized by IUAC-New Delhi in virtual mode.

Title: Tuning of ferromagnetic behavior of GaN films by N-ion implantation: An experimental and first principle-based study (**Best poster**).

[5] Poster presentation at “3rd Departmental Symposium on Advances in Physics-2019”, Indian Institute of Technology Delhi, New Delhi, India.

[6] Poster presentation at “European Materials Research Society (E-MRS) 2019 Spring Meeting”, Nice, France.

[7] Poster presentation at “2nd Departmental Symposium on Advances in Physics-2018”, Indian Institute of Technology Delhi, New Delhi, India.

Title: Structural, optical and magnetic studies on 500 keV Xe³⁺ irradiated oriented GaN films.

[8] Attended the workshop on “Advanced Simulation Methods: DFT, MD, and Beyond”(ASM2019), organized by IIT Delhi.

[9] Attended the “School on Characterization of materials” at IUAC New Delhi, organized by Inter University Accelerator Centre New-Delhi – 110067.

Research Skills

Hands-on-experience on various thin film & nanostructure deposition techniques:

- DC magnetron sputtering for deposition of oxide thin films
- Thermal evaporation technique for thin film deposition of materials
- Thermal vapor transport for the deposition of thin films
- Fabrication of metal/metal oxide thin films by Spin Coating and Dip Coating methods

Hands-on-experience on various analytical characterization techniques:

- Superconducting Quantum Interference Device (SQUID)
- UV-Vis. spectrometer equipped with diffuse reflectance geometry
- Electrical transport measurements
- LCR meter for dielectric and magneto-dielectric properties measurements

Data analysis of various analytical characterization techniques:

- Scanning and transmission electron microscopic analysis
- X-ray diffraction analysis
- Photoluminescence (PL) analysis
- Rutherford back-scattering spectroscopy
- UV-Vis analysis
- X-ray photoelectron spectroscopy
- Atomic force microscopy
- Positron annihilation spectroscopy data analysis

- SQUID data analysis
- Electrical transport data analysis

Other Academic Skills & Experience

- ❖ Teaching Assistant for B. Tech. Ist year Laboratory, for six months.
- ❖ Teaching Assistant for B. Tech. 3rd year Laboratory, for 12 months.
- ❖ Instrument Operator of SQUID at Department of Physics from July, 2018 to July 2020 and having experience of resolving the problem in magnetic power supply and the power supply to control the valves by changing some electronic devices like ICs etc.
- ❖ Student group in-charge of 'High vacuum DC magnetron sputtering system'. Having experience of upgrading the sputtering set up and resolving the problem of DC power supply by changing some electronic devices.