

Krishnadev Pandey

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Education

Maulana Azad National Institute of Technology Bhopal

(2022 - '26)

Bachelor of Technology in Materials and Metallurgical Engineering

GPA: 7.92/10

Research Interests

- **Theory-** Mechanical Behavior of Materials, Piezoelectric Materials, Semiconductor Technology
- **Applications-** Crystal Growth, Nanoscience, Materials Testing

Academic Achievements and Honors

- Among the top 10% in the Department of Materials and Metallurgical Engineering (Present)
- Earned a one-year foundational certification in Programming and Data Science from IIT Madras (2024)
- Recipient of Samsung Fellowship for India Semiconductor Workforce Development Program (2025)
- Awarded the CeNSE Summer Internship and Certificate of Distinction by IISc Bengaluru for exceptional performance in the Winter School on "Semiconductor Technology" (2025)

Research Experience

1) Determination of d coefficient and Poling optimization in thin film piezoelectric (May- Jul '25)

Guide: [Prof. Gayathri Pillai](#), Center for Nano Science and Engineering (CeNSE), Indian Institute of Science (IISc), Bangalore

Aim: To reduce substrate bending effects during d33 measurement and assess the effectiveness of AC and DC poling in enhancing the piezoelectric response of thin films

- Extracted d33 coefficient of AlN and PZT thin films on silicon substrates using **Laser Doppler Vibrometry (LDV)** measurements and validated results through **COMSOL Multiphysics** simulations
- Introduced a new **electrode design** enabling more accurate measurement of the d33 coefficient in thin film over substrate
- Performed **AC and DC poling** of thin film PZT and optimized poling conditions to enhance the d33 value
- Explored advanced characterization tools and techniques including **DC probe station, LDV, FE-SEM, XPS, Raman Spectroscopy** and developed understanding of fabrication processes—lithography, deposition and etching in **Class 100/1000 cleanroom** environment

2) Synthesis and First-Principles (DFT) Analysis of Lead Zirconate Titanate (PZT) (Jan - May '25)

Guide: [Prof. Sanjay Srivastava](#), Materials and Metallurgical Engineering Department, MANIT Bhopal

Aim: To synthesize, characterize, and perform density functional theory (DFT) calculation studies on lead zirconate titanate (PZT) pellets

- Performed synthesis using planetary ball milling process
- Characterization techniques used—XRD, SEM, Raman Spectroscopy and FTIR
- Computed band gap and density of states calculations using DFT in Materials Studio
- Currently preparing a research paper for submission based on this work

3) Crystal Growth of CdZnTe and Poling of PMN-PT Single Crystals

(Dec '24 - Jan '25)

Guide: [Manish Kumar Sinha](#), [Scientist-E](#), Solid State Physics Laboratory, Defence Research and Development Organisation (DRDO), Delhi

Aim: To understand the orientation selection for Cadmium Zinc Telluride (CZT) crystal growth and effects of poling on lead magnesium niobate-lead titanate (PMN-PT) single crystals

- Conducted extensive literature survey on selecting the (111) plane for Cadmium Zinc Telluride single crystal growth
- Examined the effects of **pulsed** and **DC poling** on piezoelectric PMN-PT single crystals
- Analyzed binary and ternary phase diagram using **Thermo-calc** software

Selected Technical Projects

1) Mathematical Relation Between Compressive Yield Strength and Hardness (Jan-Apr '24)

Guide: *Prof. C Sasikumar, Materials and Metallurgical Engineering Department, MANIT Bhopal*

- Led a six-member team to establish a mathematical relationship between compressive yield strength and hardness for different aluminium samples
- Utilized **Origin** software for data analysis and curve plotting
- Conducted experiment using the **Universal Testing Machine** and **Brinell Hardness** Testing Machine

2) Corrosion Behavior of Mild Steel under Various Environmental Conditions (Jul-Nov '24)

Guide: *Prof. Ramesh Kumar Nayak, Materials and Metallurgical Engineering Department, MANIT Bhopal*

- Investigated the effect of **different media** (HCl, HNO₃, salt spray, tap water, environment chamber, soil) and varying exposure time and temperature on the corrosion rate of mild steel
- Examined the **type of corrosion** in each sample and evaluated potential corrosion prevention methods

3) Hydrogen Embrittlement in Dissimilar Material Joints (Sep-Oct '24)

Guide: *Prof. Ramkishor Anant, Materials and Metallurgical Engineering Department, MANIT Bhopal*

- Developed framework to understand hydrogen embrittlement in dissimilar material joints
- Studied various modeling techniques: **Phase-Field Modeling**, **Scale-Bridging Modeling**, and **Multiscale Modeling**

Industrial Training

Vocational Trainee at Steel Authority of India Limited

(Jul '24)

Bhilai Steel Plant, Steel Authority of India Limited (SAIL)

- Completed two-week vocational training at blast furnace, plate mill, coke oven, and sinter plant
- Gained exposure to the integrated steel plant operations to understand the processes involved in iron extraction from ore, its conversion into various steel grades and production of commercial goods

Extracurricular Activities

- Organized a Short Term Training Programme (STTP) on “AI/ML In Computational Material Science”
- Studied Sanskrit language for 3 years as a subject in secondary school
- Active member of Indian Institute of Metals (IIM) and Institute of Corrosion (UK), engaging with national and international research communities in materials science
- Secured 2nd position in an inter-school mixed sports competition (chess, cricket, and badminton) among 8 teams

Relevant Coursework & Technical Skills

Materials Engineering	Physical Metallurgy, Mechanical behavior of Materials, Materials Characterization, Corrosion Science, Welding, Casting and Solidification, Iron and Steel Making, Composite Materials, Ceramic Science, Destructive and Non-Destructive Testing
Mathematics	Linear Algebra, Calculus, Complex Analysis, Differential Equations, Numerical Analysis, Linear Programming
Languages & Tools	Python, Origin, Thermo-Calc, VESTA, Materials Studio, COMSOL Multiphysics

References

Prof. C Sasikumar

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