

## STATEMENT OF PURPOSE

In this fastest moving world of advanced technology, we need promising materials to cope with. To ease our life, we need to design and develop new materials. My journey with condensed matter physics started with curiosity when I tried to learn the practical essence of physics, which saw its inception during my master's degree in physics at IIT INDORE. In addition to the coursework, I started working in the laboratory and acquainted the lab culture which encouraged me to work on the project "Structural and electronic properties of transition metal oxides".

I have been working on the ZnTiO<sub>3</sub> and doped ZnTiO<sub>3</sub> system. This material is least explored due to the less probability of formation of pure ZTO. This material has wide application in the optoelectronic industry. In this work, I tried to explore the correlation of structure and properties of the ZTO and ZTO-based materials and their application as sensors and photo catalysts. I plan to explore the realm of thin-film deposition to study the practical applications of ZTO-based materials to reconnoiter the scope of device fabrication.

I am also working on NiO and doped (Al/Li) NiO system. Preparation of nickel oxide (NiO) Nano powder was done by the sol-gel process. The product was characterized by X-ray diffraction (XRD), UV- Visible, Raman Spectroscopy, Cyclic Voltammetry, Light sensing, and electroluminescence. The XRD pattern showed that the NiO stabilizes in the cubic (Fm-3m) phase. From the Hall Effect measurement, it is confirmed that the NiO is a p-type semiconductor. SEM analysis showed that the NiO powders consisted of particles with sizes in the 20-35 nm range. A cyclic voltammetry study of the NiO Nano powders showed a quasi-reversible redox process showing potential for pseudo capacitance.

In two-year, I handled instruments such as X-Ray diffraction measurement (Bruker D2 Phaser), Raman Spectrometer (Horiba lap spec), UV-Visible Spectrometer (ocean optics), SEM (Carl Zeiss), RF Sputtering, and Cyclic Voltammetry (klyte). I found the journey to be professionally and personally rewarding.

Now, I am sanguine about starting an endeavor in the field of optoelectronics by finding new advancements through this program. **I'll try my level best to publish an impressive number of papers in good quality journals.**