

# Investigation on the Nitride Perovskite Nanostructures

Thanga Bharathi. T and Jeganathan. K\*

Centre For Nanoscience and Nanotechnology, Department of Physics,  
Bharathidasan University, Tiruchirappalli,  
Tamil Nadu, India - 620 024.

Corresponding author Email id\*: [kjeganathan@bdu.ac.in](mailto:kjeganathan@bdu.ac.in)



RESEARCH PLATEAU  
PUBLISHERS

## Objective

- To investigate the existence of Nitride perovskite nanostructures
- To synthesize Lanthanum Tungsten Oxynitride in the investigation of  $\text{LaWN}_3$  and study its physicochemical properties

## Introduction

- Perovskites are fascinating and most studied class of materials with diverse scientific applications,  $\text{ABX}_3$  formula
- The advent of Nitride perovskites in the recent years has terminated stability issues recurring in Oxide and Halide perovskites
- $\text{LaWN}_3$  - Better stability, Large Ferroelectricity and 1.8 eV bandgap

## Materials and synthesis

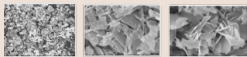
Method	: Ammonothermal reaction
Precursor	: Lanthanum Tungsten Oxide
Reactive gas	: $\text{NH}_3$ (300 sccm) + $\text{N}_2$ (100 sccm)
Pressure	: Atmospheric pressure
Temperature	: 1000 °C
Time duration	: 15 hrs

## Schematic diagram of CVD Furnace

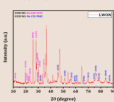


## Results and discussion

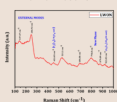
### FESEM Results



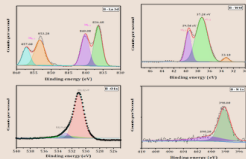
### XRD results



### Raman results



## XPS results



## Conclusion

- Lanthanum Tungsten oxynitride mixed phase has been synthesized in the investigation of  $\text{LaWN}_3$  via a high temperature Ammonothermal reaction
- The Structural, Optical and compositional properties of the synthesized LWON are analyzed using FESEM, XRD, Raman and XPS analysis respectively

## Future Works

- To synthesize Lanthanum Tungsten Nitride perovskite material
- To fabricate it on a Suitable substrate by means of Physical Vapor Deposition Techniques
- To use it as a photoelectrode for Green hydrogen generation using Water splitting approach

## References

- Talley, K. R., Mangum, J., Perkins, C. L., Woods-Robinson, R., Mehta, A., Gorman, B. P., ... & Zakutayev, A. (2019). Synthesis of lanthanum tungsten oxynitride perovskite thin films. *Advanced Electronic Materials*, 5(7), 1900214.
- Talley, K. R., Perkins, C. L., Diercks, D. R., Brennecke, G. L., & Zakutayev, A. (2021). Synthesis of  $\text{LaWN}_3$  nitride perovskite with polar symmetry. *Science*, 374(6574), 1488-1491.
- Talley, K. R., Perkins, C. L., Diercks, D. R., Brennecke, G. L., & Zakutayev, A. (2020). Synthesis of ferroelectric  $\text{LaWN}_3$ --the first nitride perovskite. *arXiv preprint arXiv:2001.00633*.

## Acknowledgement

- The author gratefully acknowledges the MOE-RUSA 2.0 (R & I) Physical Sciences, Government of India
- K.J gratefully acknowledges to DST - Nanomission, DRDO and DST-FIST for the financial support and infrastructural facilities.