

SNEHA UPADHYAY

Knoxville, TN • (740)-590-6706 • sneha.upadhyay.phy@outlook.com

SUMMARY

Postdoctoral Research Associate at Data Nano-Analytics (DNA) group at Center for Nanophase Materials Sciences (CNMS), ORNL.

TECHNICAL SKILLS

- Over 6.5 years of experience in epitaxial thin film deposition via molecular beam epitaxy (**MBE**)
- **Vacuum Systems:** Experience working with UHV and HV chambers. Ability to operate and maintain cryopumps, turbopumps, ion pumps, mechanical pumps, residual gas analyzers (RGA), helium leak checks, and chamber bakeouts.
- Reflection high-energy electron diffraction (**RHEED**) experience, including quantitative analysis and RHEED-driven growth processes.
- **Thin film metrology**, including familiarity with the following techniques: X-ray diffraction (**XRD**), X-ray reflectivity (**XRR**), atomic force microscopy (**AFM**), Rutherford backscattering spectroscopy (**RBS**), X-ray photoelectron spectroscopy (**XPS**), electron microscopy (**SEM/TEM**), scanning tunneling microscopy (**STM**), scanning transmission electron microscopy (**STEM**).
- Experience with epitaxial growth of materials like MnN, MnGa, CrN, GaN, and Mn₃Sn.
- **Cryogenics:** Experience carrying out effective fills using liquid helium (4K) and liquid nitrogen (77K).
- Design tools: AutoCAD (beginner)
- Analysis tools: OriginPro, WsXM, Gwydion.
- Programming tools: Python (beginner), MATLAB (beginner),

EXPERIENCE

Postdoctoral Research Associate | Oak Ridge National Laboratory 2024 - Present

- Undergoing training on different STM systems
- Focus is to implement the autonomous workflow for STM to effectively carry out atom manipulation using machine learning.

Graduate Research Assistant | Ohio University 2017 - 2024

- Upgraded the sample handling system in a custom-built MBE-SPSTM low-temperature system.
- Designed and installed a new traveling thickness monitor for improved flux measurements.
- Assisted in building a new STM scanner and carried out tabletop and vacuum testing to check movement, scanning, and noise.
- Ensuring functioning, regular maintenance, and repairs of the MBE-SPSTM system.
- Plan and design deposition experiments aimed at improving film quality.
- Analyze and review metrology data with thin film characterization techniques.
- Collaborate with theory and experimental groups.
- Plan, design, and implement a new growth protocol for achieving epitaxial c-plane Mn₃Sn on MBE-grown substrates. Samples are characterized using thin film techniques to obtain thickness, morphology, and composition.

Teaching Assistant | Ohio University 2016 - 2018

Pre-doctoral | KU Leuven 2014 - 2015

Worked with Class IV laser and z-scan spectroscopy technique—initial knowledge of time-of-flight experiments.

EDUCATION

Ph.D. Physics | Ohio University 2016 - 2024

Dissertation: "Growth and Surface Study of Mn₃Sn using Molecular Beam Epitaxy."

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- Designed and successfully implemented most a -plane oriented Mn_3Sn growth on c -plane Al_2O_3 . The results then showed that the material undergoes substrate strain effect, supported by theoretical results.
- Designed and implemented a two-step growth protocol to grow epitaxial flat films of a -plane Mn_3Sn on c -plane Al_2O_3 . Successfully achieved a flat contiguous film and worked with theoretical collaborators to understand how the strain affected mechanical properties.
- Designed and implemented the growth of c -plane oriented Mn_3Sn on c -plane Al_2O_3 , resulting in a 3D film.

Master of Science | Ohio University 2017 - 2018

Thesis: "Investigation of Possible Exchange Bias in L10 MnGa/ θ - MnN Bilayers."

Pre-Doctoral | KU Leuven. 2014 - 2015

Master of Science | Symbiosis Institute of Technology 2012 - 2014

Bachelor of Science | Sardar Patel University 2009 - 2012

LIST OF PUBLICATIONS

1. Sneha Upadhyay et al. "Exploring the Interfacial Structure and Crystallinity for Direct growth of Mn_3Sn (0001) on Sapphire (0001) by Molecular Beam Epitaxy", *Surface and Interfaces* 42, 103379 (2023).
2. Sneha Upadhyay et al. "Molecular Beam Epitaxy and Crystal Structure of Majority a -plane-oriented and Substrate-strained Mn_3Sn Thin Films Grown Directly on Sapphire (0001)". *J. Vac. Sci. Technol. A* 41, 042710 (2023).
3. Piero Ferrari, Sneha Upadhyay, et al. "Wavelength-Dependent Nonlinear Optical Properties of Ag Nanoparticles Dispersed in a glass host." *J. Phys.Chem. C* 121, 49 (2017).
4. Sneha Upadhyay et al. "Influence of crystallite size on the magnetic properties of Fe_3O_4 nanoparticles", *Journal of Alloys and Compounds* 678 (2016).

LIST OF POSTER/ ORAL PRESENTATION

1. North American Molecular Beam Epitaxy Conference, Madison 2023; Oral Presentation
2. AVS Ohio Symposium 2023, Dayton; Poster
3. 8th Spin-Polarized Scanning Tunneling Microscope (SP-STM) conference, Ohio State University; Poster.
4. Student Research and Creative Activity Expo 2023, Ohio University; Poster.
5. Nanoscale Quantum Phenomena Institute Poster Session 2023, Ohio University
6. 48th Conference on the Physics and Chemistry of Surfaces and Interfaces (PCSI) 2023, Redondo Beach, California; Oral Presentation and Poster
7. 68th American Vacuum Society International Symposium and Exhibition 2022, Pittsburgh; Oral Presentation.
8. North American Molecular Beam Epitaxy Conference, Delaware 2022; Oral Presentation
9. Material Research Society (MRS) Virtual Spring Meeting and Exhibit 2022; Oral Presentation
10. Student Research and Creative Activity Expo 2022, Ohio University; Poster
11. Nanoscale Quantum Phenomena Institute Poster session 2022, Ohio University
12. Nanoscale Quantum Phenomena Institute Poster session 2019, Ohio University.
13. OSU Materials Week 2019, Ohio State University; Poster.
14. 66th AVS International Symposium and Exhibition 2019; Columbus, Ohio; Poster

AWARDS/RECOGNITION

1. Awarded the Graduate Research Award 2023 by American Vacuum Society (AVS)
2. Awarded the Nanoscale & Quantum Phenomena Institute (NQPI) Student Fellowship; Fall 2023; Ohio University.
3. AVS Ohio Symposium 2023, Dayton; Poster- Awarded First place.
4. Student Research and Creative Activity Expo 2023, Ohio University; Poster – awarded Second Place.
5. Nanoscale Quantum Phenomena Institute Poster session 2023, Ohio University; Poster – awarded First Place.
6. Awarded the AVS 68 Dorothy M. Earl S. Hoffman Travel Grant 2022.

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7. Nanoscale Quantum Phenomena Institute Poster session 2019, Ohio University; Poster – awarded First place.

OTHER ACTIVITIES

1. Student member of the EDI committee in the Physics and Astronomy Department, Ohio University (2020-2024)
2. Teaching Assistant Auditor, Department of Physics and Astronomy, Ohio University (2020-2022)
3. Core committee member of the Indian Student Association, Ohio University (2017-2020)
4. Volunteer in judging at the District Science Fair, Athens, Ohio.
5. Volunteer in the Outreach at Family Science Night, Ohio University, Athens Ohio.