Report
on
WORKSHOP ON SYNTHESIS AND CHARACTERIZATION OF NANOFERRITES

The **Department of Physics** successfully conducted a **one-week Workshop on "Synthesis and Characterization of Nanoferrites"** under the supervision of **Dr. Kirti Singha, from November, 12, 2025 to 19,2025**,. The workshop was held in the **newly established Nanomaterial Research Laboratory** set up under the **DBT Star College Scheme**. The Workshop provided hands-on research exposure to students, training and insights into the synthesis and applications of nano ferrites materials. and marked a significant step towards strengthening undergraduate research culture in the department. About 32 students filled the registration form, but 14 students completed the workshop successfully.

Day 1 : Introduction, Literature Review and Lab setup

The workshop begin with an introduction to synthesis techniques, methodologies and basic principles of nano ferrites . We explored the spinel ferrite crystals structure ($AB_2\ O_4$) and discussed their properties such as tuneable magnetic and thermal stability.

We also learned to access research papers through Google Scholar, reviewed relevant literature, and finalized the series of Nickel ferrite. The doping was done by Cobalt and Zinc. The laboratory setup and all required precursors were then made ready.

Day 2 : Preparation of the Mother Sample

Work commenced at 8:00 A.M. with the synthesis of the Nickel ferrite mother sample through the Sol Gel Auto Combustion Method through the following steps :

Preparation of precursor solutions

Chelation using citric acid

Ph adjustment

Sol formation

Gelation

Drying and

Auto-combustion

All steps were completed by 8:30 P.M.

Centre of Excellence Govt. College Sanjauli, Shimla - 06
(NAAC accredited with an A+ grade institution)

WORKSHOP ON SYNTHESIS & CHARACTERIZATION OF NANOFERRITES

November 12-19, 2025

Under Graduate Physics Student Society

Organized by
Department of Physics
Centre of Excellence
Govt. College Sanjauli Shimla - 06

PATRON

Prof. Bharti Bhagra
Principal, COE, Govt. College Sanjauli

WORKSHOP COORDINATOR

Dr. Kirti Singha
Asst. Professor
Coordinator DBT-Star College Scheme
Dept. of Physics, COE, Govt. College Sanjauli

CONVENER

Mr. Narender Thakur
Asst. Professor
Dept. of Physics, COE, Govt. College Sanjauli

ORGANIZING COMMITTEE

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(Under Graduate Physics Students Society)
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Abhishekh, Member, UPSS
Vanshika, Member, UPSS
Anjali, Member, UPSS
Yugal, Member, UPSS
Lalit, Member, UPSS
Kritika, Member, UPSS
Pushkar, Member UPSS
Nikhil, Member, UPSS
Abhinav, Member, UPSS

REGISTRATION

There is no registration fee for this Workshop, though, **prior confirmation of participation is necessary** through the link:https://forms.gle/tewiJMYMBCrXZGiv5

7018358537, Dr. Kirti Singha
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CONCEPT

Nanoferrites have emerged as one of the most promising functional materials due to their unique magnetic, catalytic, and electronic properties. This workshop aims to provide participants with theoretical understanding and hands-on experience in the controlled synthesis of nanoferrites using modern laboratory techniques.

OBJECTIVES

- To provide theoretical understanding of ferrites and nanoferrites.
- To introduce various synthesis routes such as sol–gel, co-precipitation, and hydrothermal methods.
- To train participants in characterization techniques like XRD, SEM and VSM.
- To develop practical skills for handling nanomaterial synthesis equipment.
- To encourage research and innovation in nanoscience.

RESOURCE PERSONS

Dr. Kirti Singha (Synthesis of Nanoferrites)

Dr. Pooja Dhiman (Characterization of Nanoferrites)
(Coordinator, International Research Centre of Nanotechnology for Himalyan Sustainability, Shoolini University)

Day 3 : Calcination of Sample 1 and preparation of Doped Sample

The mother sample was ground and placed in the muffle furnace for calcination at 800^{o} C for 4 hours, beginning at 8:40 A.M. Parallelly, we prepared our first series of Ni-Co doped zinc ferrites, completing sol-gel preparation up to the auto-combustion stage by 9:00 P.M.

Day 4 : Completion of Mother Sample and preparation of Sample 3

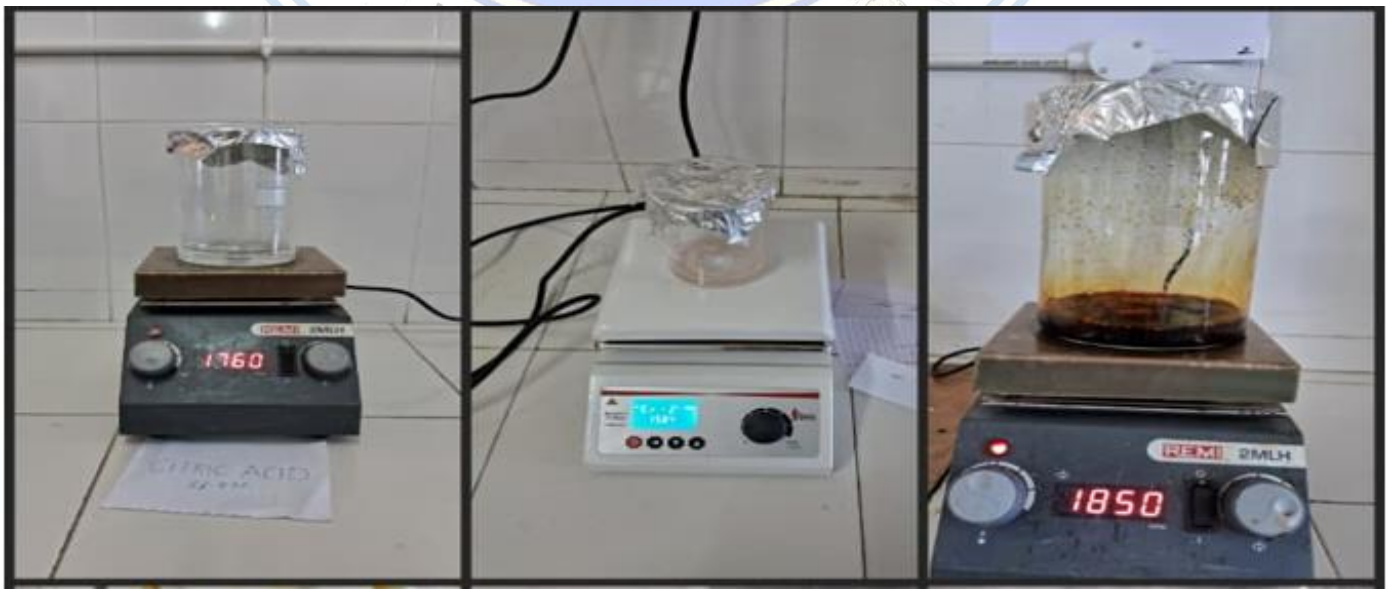
After calcination, the mother sample was grounded thoroughly, yielding 5.987g of powder . Sample 2 was then placed for calcination at 9:15 A.M. while we began preparing Sample 3 the second series of Nickel ferrites. Auto-combustion was finished by 10:00 P.M.

Day 5 : Completion of Sample 2

Sample 2 was removed from the furnace, ground, and weighed at 7.021g. sample 3 was simultaneously placed for calcination at 9:15 A.M. and work concluded at 6:00 P.M.

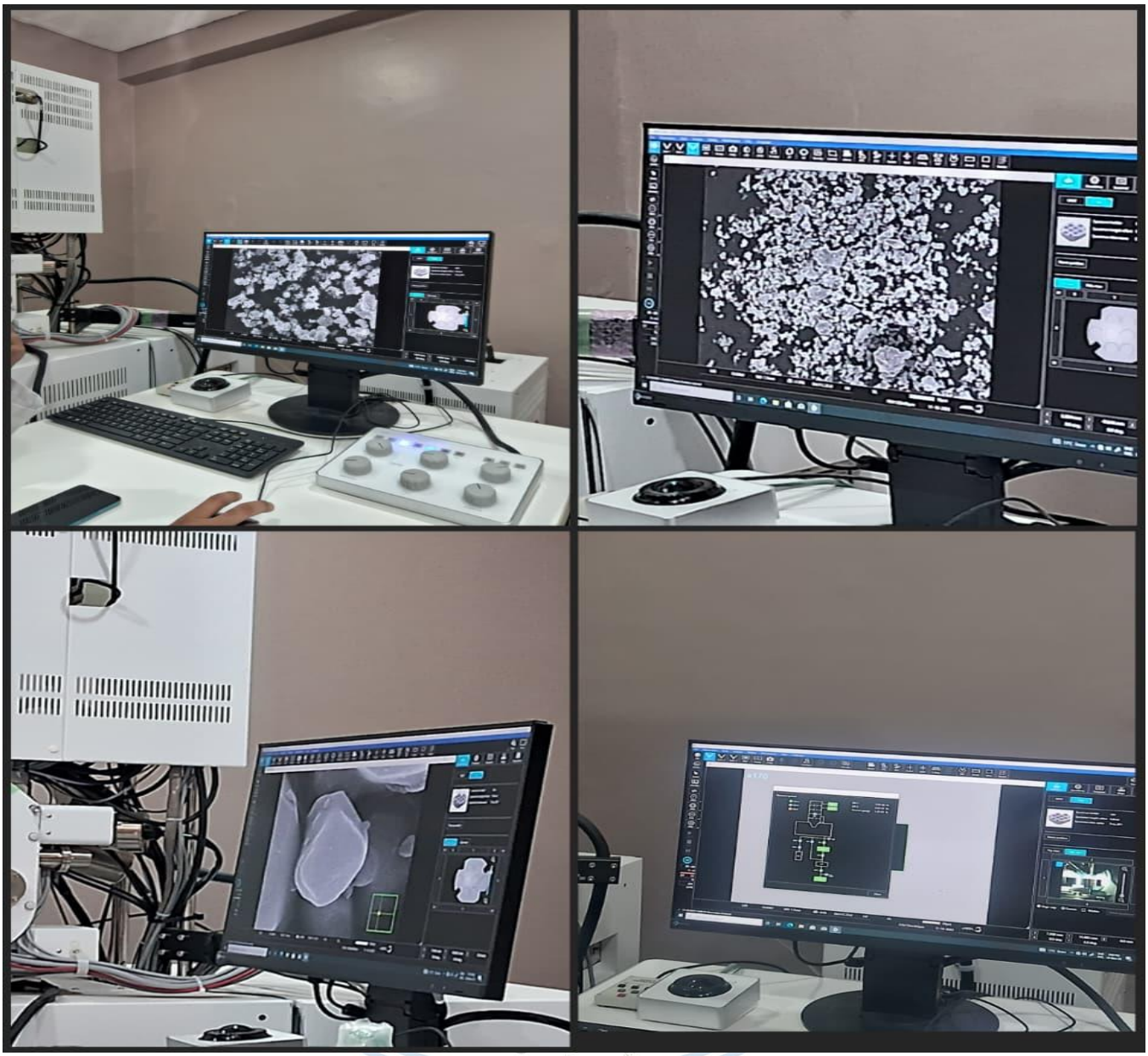
Day 6 : Completion of Sample 3

Sample 3 was taken out from the furnace, ground and weighed at 8.539 g . By this day , all three samples were ready for characterization . We express gratitude to Shoolini University for providing access to their research facilities under established MOU with our college.



Day 7 : Characterization and Valedictory Session

A group of students visited Shoolini University for characterization, where X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM) analysis were performed on our samples.



Meanwhile, the other participants prepared for the concluding session. The valedictory session commenced with a warm welcome address by **Dr. Kirti Singha**, Coordinator of the Workshop, on **November 19, 2025**, who guided and supported the participants throughout the seven-day programme. The session was chaired by the **Principal of the College**.

We were also privileged to have **Dr. Pooja Dhiman** from **Shoolini University** as the resource person. She is presently serving as **Coordinator, International Research Centre of Nanotechnology for Himalayan Sustainability at Shoolini University**. Dr. Dhiman delivered a highly insightful and fruitful lecture on various characterization techniques and explained the types of analyses obtained through these techniques.

The detailed report of the seven-day workshop was presented by **Ms. Vanshika**, a student of **B.Sc. IIIrd Year**, followed by feedback from the participants, **Kritika** BSc Ist year and **Nikhil,** B.Sc. Ist Year. A comprehensive presentation highlighting the entire workshop was delivered by **Mr. Abhishekh**, also a student of **B.Sc. IIIrd Year**.

The valedictory session was gracefully compered by **Ms. Tammana**, Vice President, **UPSS**, Department of Physics. The Vote of thanks was delivered by **Miss Anjali**, a student from BSc. IIIrd year.Certificates were distributed to the participants who successfully synthesized nanoparticles, supported by satisfactory **XRD results**.This valedictory session marked the successful and meaningful conclusion of the seven-day workshop.

Conclusion: This workshop provided an invaluable platform for undergraduate students to experience advanced research techniques typically introduced at postgraduate or doctoral levels. Under the guidance of Dr. Kirti, We gained confidence in sample synthesis, lab equipment handling and the overall research workflow . Beyond technical skills, this experiences depended our understanding of the research process and its challenges, marking the beginning of our journey into scientific experimentation inquiry.

Compiled by: Tammana Vice President UPSS), B.Sc. IIIrd Year
Edited & Submitted by: Dr. Kirti Singha (HOD, Department of Physics