

Add-On Course

Topic: Synthesis of some inorganic downconverting materials for anti-counterfeit and bioimaging applications

by

Department of Physics
St. Xavier's College, Ranchi

Course objectives

This course will equip students with the knowledge and practical skills to synthesize inorganic materials using solid-state reaction and ball milling techniques, followed by characterization of their electrical and optical properties. Students will learn to tailor material properties for specific applications by changing synthesis parameters, calculation of crystal field parameters and analysis of characterization data.

Syllabus outline

1. Understanding fundamental concepts :

Students will gain a solid understanding of solid-state reactions, ball milling and the principles governing material synthesis. This includes understanding of phase transformations, reaction kinetics, crystal field parameters and the impact of milling on material's structure and properties.

2. Material synthesis:

Students will learn to synthesize materials using solid-state reactions and planetary ball mill method, including optimization of reaction parameters and variation of milling parameters.

3. Characterization, data analysis and application:

Students will become proficient in using various characterization techniques, including X-ray diffraction (XRD) spectroscopy for identification of phase and evaluation of crystallite size, UV-visible spectroscopy for band gap calculation and electrical parameters like dielectric, conductance, etc. to investigate the properties of synthesized materials and to explore the prepared material for anticounterfeit and bioimaging applications. Students will learn to analyse and interpret data obtained from characterization techniques to understand the properties of the synthesized material.

Learning outcomes

By the end of the course, students will be able to use their knowledge to design materials for specific applications like solar cells, microelectronics, medical devices and implants, therapeutics, ceramic industries etc.

Number of Seats: 30

Target Group: Any student of Bachelor of Science (B. Sc.) can apply.

Duration: The course will be of 30 contact hours comprising 15 hours of classroom teaching and 15 hours of experimental work for material synthesis and characterization.

Certification: The participants will be provided with a certificate upon successful completion of the course.

Course Fee : 2000/- per participant

Registration: The google form to apply for this course is available in the St. Xavier's College, Ranchi website

Commencement of classes: From next academic session, July, 2025 onwards.

Course Coordinator: Dr. Mitesh Chakraborty

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