

CH-223 Introduction to Nano-chemistry

Credit Hours: 2-1

Pre-requisite: Nil

Course Objectives

1. This course aims to provide students with an introduction to nanostructured materials (NSM), several techniques used for their synthesis as well as various properties related to nanomaterials. This course will provide the students with all the background knowledge required to study advance courses on nanomaterials and their practical applications in the next semesters.

Course Contents

2. Introduction to Nanomaterials and Nanotechnology, Classifications of Nanostructures, Peculiarities of nanostructured materials, Instability of nanostructured materials due to grain growth, Effect of size on NSM, Synthesis of NSM, Morphology of NSM and Applications of NSM.

Course Outcomes

By the end of this course, the students will be able to:

3. investigations.
4. Nanomaterials.
5. Synthesis of nanomaterials
6. Growth of NSM and their practical applications.

Relevant Experiments

1. Green and chemical synthesis of Ag NPs.
2. ii) ZnO, CdS, Mn₂O₃ nanoparticles for band gap studies
3. iii) Photocatalytic dye degradation using nanostructures
4. iv) Quantum dots synthesis ZnS
5. v) Water Splitting or similar experiments. Electrodeposition.
6. Synthesis of Ag Nanoparticles to Detect Copper(II) Ions.
7. Preparation of colored glass, involving Preparation and Characterization of Silica Films Colored with Metal Ions and

Nanoparticles.

8. Synthesis of Iron Oxide Nanoparticles and their Application in Photo-/electro-Fenton Process
9. Synthesis of Magnetic Nanoparticles Using Potato Extract for Dye Degradation
10. Spectroelectrochemical Experiment for Studying Water Oxidation with Metal Oxide Catalysts.
11. Synthesis of Copper(I) Oxide Particles with Variable Color: Demonstrating Size-Dependent Optical Properties.
12. Quantum Dots Synthesis and observation of Tyndall Effect.
13. Synthesis of Fluorescent Carbon Quantum Dots from Lemon Juice for Iron Sensing.

Recommended Books

1. Pokropivny, V., Lohmus, R., Hussainova, I., Pokropivny, A., and Vlassov, S., "Introduction to Nanomaterials and Nanotechnology", Tartu University Press (2007).
2. Brechignac, C., Houdy, P. and Lahmani, M., "Nanomaterials and Nanochemistry", Springer (2006).
3. Vollath, D., "Nanomaterials: An Introduction to Synthesis, Properties and Applications", 2nd Edition, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany (2013). Edelstein, A.S., and Cammarata, R.C., "Nanomaterials: Synthesis, Properties and Applications", Taylor and Francis Group (1998).
4. Current Literature and Reviews.