

Nano structured materials- synthesis, properties, self assembly and applications - Video course

COURSE OUTLINE

- The properties of nanoparticles are strongly dependent on size and shape.
- It is therefore important to synthesize these materials using a methodology that is able to finely control these structural parameters and the corresponding polydispersity degree.
- In this course we focus on synthetic aspects for the design of nanostructured materials.
- We describe different approaches including both the bottom-up (includes both chemical and physical methods) and the top-down methods (mainly physical methods) for the synthesis of nanostructured materials.
- The course will then focus on different type of nanostructures with a special emphasis on carbon nanotubes (CNT), metal and metal oxide nanoparticles, core-shell nanostructures and self assembly of these nanostructures.
- The dependence of various properties (dielectric, magnetic and optical) with size will be discussed.

COURSE DETAIL

Modules	Topics	No. of Lectures
Module 1	Introduction to nanotechnology and the two approaches (bottom up and top down) followed for the synthesis of nanomaterials.	2



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Nanotechnology

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Module 2	Synthetic methodologies	12
	i) Sol-gel.	
	ii) Micromulsion.	
	iii) CVD,PVD,Molecular beam epitaxy.	
	iv) Vapor (solution)- liquid-solid growth, (VLS or SLS).	
	v) Spary Pyrolysis.	
	vi) Template based synthesis.	
	vii) Lithography.	
Module 3	Various kind of Nanostructures	14
	i) Carbon fullerenes and CNT.	
	ii) Metal and metal oxide nanowires.	
	iii) Self assembly of nanostructures.	
	iv) Core-shell nanostructures.	
	v) Nanocomposites.	

Module 4	Physical Properties of nanomaterials	12
	i) Photocatalytic.	
	ii) Dielectric.	
	iii) Magnetic.	
	iv) Optical.	
	v) Mechanical.	
	Total	40

References:

1. **Guozhong Cao, Nanostructures and Nanomaterials : Synthesis, Properties and Applications, Imperial College Press 2004.**
2. **T. Pradeep, Nano: The Essentials Understanding nanoscience and nanotechnology, Tata McGraw-Hill Publishing Company Limited NEW DELHI, 2007.**
3. **Nanomaterials Synthesis, Properties and Applications** Edited by A S Edelstein and R C Cammarata, IOP Publishing Ltd 1996.