

Department of Chemical Sciences
Graduate Course on
Materials Chemistry

Part 1

Part A: Introduction to Materials Chemistry

Part B: Physical Characterization Techniques

1. X-ray diffraction (single crystal and Powder)
2. Optical and Electron Microscopy (TEM and SEM)
3. Surface Analysis: Surface Probe Microscopy (STM, AFM)
4. X-ray Photoelectron Spectroscopy
5. Surface Area and Thermal Analysis: BET and TGA, DTA and DSC

Part 2

Part A: Introduction

1. Size Dependant Aspects, Hierarchy, Size length scales, (Why Nano? (bulk vs clusters vs nanosized); Basics of Solid State Chemistry; Bio-inspiration
2. Top-Down vs. Bottom-up Approach

Part B: Synthesis & Application

1. Biomimicry/Biomineralization
2. Self Assembly, SAMs, DNA Origami
3. Soft Lithography
4. Chemical Synthesis of Nanoparticles, Nanorods, Nanospheres, Thin films, core-shell structures etc. (*concentrating on Inorganic Solids*)
5. Templating effect – amphiphiles, proteins, block copolymers
6. Reticulated structures – ie. Porous solids and formation of void cavities (early history of zeolites to novel porous metals)
7. Photonic crystals
8. Applications: Materials Science for Energy capture, storage and conversion
9. Environmental Issues

Evaluation

1. Mid-term exam: 30%
2. 4 Assignments: 20%
3. Final Exam: 50%

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Venue: Lecture room AG80

Days: Tuesdays and Thursdays

Time: 11:15 hrs to 12:30 hrs

The first lecture starts on August 28, 2018