

Department of Chemical Sciences

Graduate Course on Materials Chemistry

Part 1 (10 Lectures)

Physical Characterization Techniques For Materials Chemistry:

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

Part 2 (25 Lectures)

Formation of “Small” Structures for Advanced Applications

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

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Venue: Lecture room AG-80

Days: Tuesdays and Thursdays; **Time:** 11:00 hr to 12:30 hr

The first lecture starts on August 17, 2017.

Evaluation: Mid-term exam: 30%; 4 Assignments: 20%; Final Exam: 50%