

Chemistry of Advanced Materials

CHM 4932

Instructor

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MW 3:30 - 4:45 PM | ISA 3050 | CRN 90475; CRN 90477

Course Prerequisites

CHM 2046, CHM 2046L

Course Description

This is an upper-level undergraduate and graduate lecture-based course for students with an interest in Chemistry, Materials Science, Physics and Engineering (3 credit hours). It will focus on fundamental structure property relationships, covering a wide range of materials that are utilized in important industrial applications, such as solar cells, batteries, quantum computers, materials for space and aerospace applications, materials for construction and maritime applications. Students will learn the structural factors that allows the design and synthesis of materials with specific properties and vice versa. Some of the examined families of compounds will be: semiconductor materials, porous materials, thermoelectric materials, thermochromic materials, piezoelectric materials, polymers, ceramics and metal alloys.

Textbook

Introduction to Materials Chemistry, 2nd Edition, Harry R. Allcock, Wiley.

Supplementary material:

- Chemistry of Advanced Materials: An Overview*, Leonard V. Interrante, Mark J. Hampden-Smith, Wiley,
- Advanced Materials*, Edited by: Theodorus van de Ven and Armand Soldera, De Gruyter,
- Solid State Materials Chemistry*, Woodward, Karen, Evans, Vogt, Cambridge University Press.

Course Objectives

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

- Identify what is the relationship among crystal structure and materials properties (optical, electronic, mechanical).
- Explain why materials with the same structure but with different composition have different properties.
- Assess the structural requirements for a compound for existing or new applications.
- Plan synthetic pathways that will allow the acquisition of a material with specific crystal structure, based on literature research.
- Design novel materials with targeted properties.
- Communicate the results of their studies to non-experts.

