Chemistry 354
Solid State Chemistry

Course Instructor:
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Course Materials:

- There is no text for this course. We will draw from the primary literature extensively, supplemented with selected readings from different texts.
- Library Reserve materials:
  - Anthony R West, 'Basic Solid State Chemistry'
  - 'Fundamentals of Crystallography,' Ed. Giacovazzo
  - 'Inorganic Materials Chemistry,' Weller
  - 'Solid State Chemistry and its Applications,' West
  - 'Structural Inorganic Chemistry,' Wells

The Structure of Materials

The Structure of Crystalline Solids: lattices and three-dimensional structures will be discussed

Bonding in Solids: topics include bonding in elemental and multi-element solids, and cohesive forces.

Characterization of Solids

Diffraction and the Reciprocal Lattice: Bragg and von Laue descriptions of diffraction in both single crystals and polycrystalline samples will be discussed

Microscopy, Spectroscopy and Thermal Analysis: other methods of characterization will be discussed

Defects, Non-Stoichiometry and Solid Solutions: point and extended defects, dislocations and solid solution mechanisms will be discussed

Synthesis Techniques

Topics include solid state reactions, sol-gel methods, hydrothermal techniques, intercalation, thin film preparation and crystal growth

Problem Sets. A list of assigned problems for the text will be posted on Blackboard each Monday. Selected problems from each list will be collected the following Monday. Due dates will always be specified on Blackboard. Students are encouraged to work together on the homework. However, each student **must** hand in his or her own copy of the problems that are to be graded. Please note that the problem sets for this course are designed to require information from many different sources.

Oral Reports. Each student will give a 30 minute presentation on a different topics within solid state chemistry. A list of topics is attached. Some guidelines include:

- Please use Powerpoint. I will post Powerpoint files on Blackboard as is, including notes.
- Try to answer most or all of the following questions in your talk:
  - what is the structure of the compound?
  - what are some of its physical properties?
  - how is the compound produced? is it commercially available?
  - how is the compound technologically useful?
  - is the compound part of a class of related compounds?

    - is there a recent example in the primary literature of the use of this compound?
- Students are required to preview talks with me two days before it is given to the class. Come with a finished talk.
- Please email 3 suggested homework problems to me before your class presentation. These questions should be fairly simple, but not so simple that everyone could answer the questions without hearing the talk.
- Talks will be schedule for the last weeks of class.

Please let me know if you have any preferences for specific compounds or dates of presentation by Friday September 11.

Exams. One exam will be given at the end of the quarter. Questions from student presentations will appear on this exam.

Grading.

Problem Sets	30 %
Presentation	20 %
Exam	20 %
Class participation	30 %

Students who think they may need accommodations in this course because of the impact of a disability are encouraged to meet with me privately early in the semester. Students should also contact Rick Webb, Coordinator, Office of Disabilities Services (rwebb@haverford.edu, 610-896-1290) to verify their eligibility for reasonable accommodations as soon as possible. Early contact will help to avoid unnecessary inconvenience and delays.

IV. List of Compounds and Systems for Oral Reports
Here is a list of suggested compounds or systems.

- Cuprate superconductors
- Colossal magnetoresistance materials
- Quasicrystals
- Thermoelectrics
- Fast ion conductors
- Aluminosilicate zeolites
- Intercalation compounds
- Aerogels / Xerogels
- Zintl phases
- Steel
- Metal nitrides