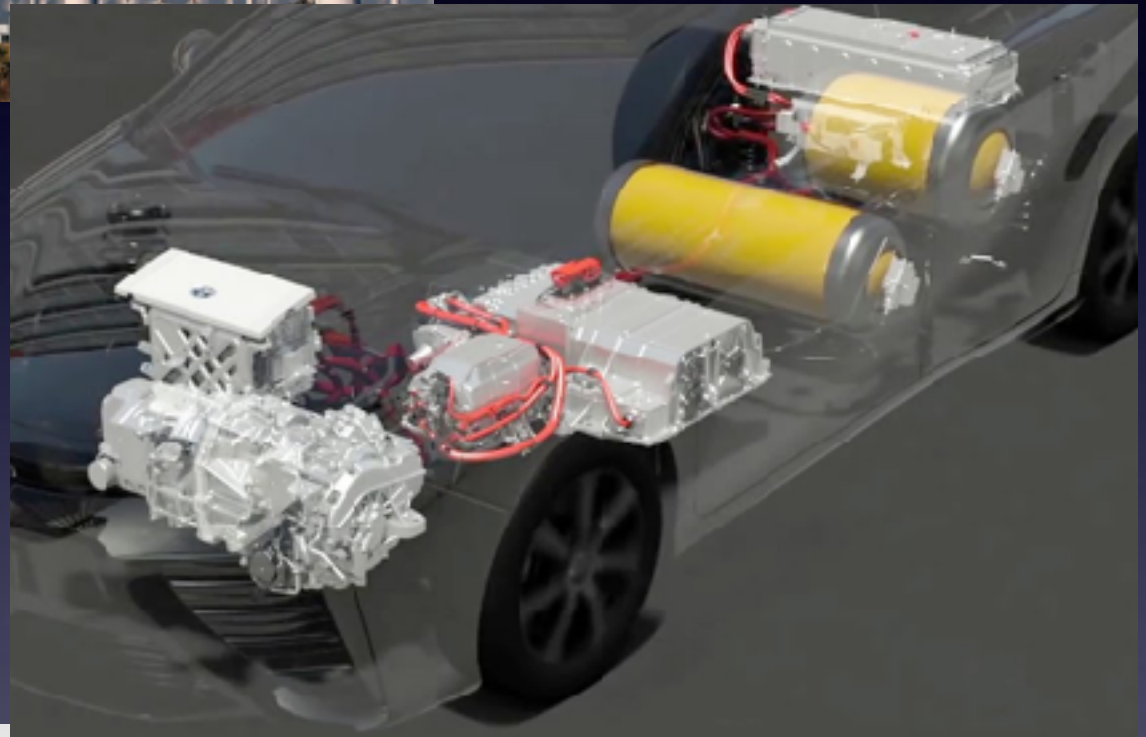
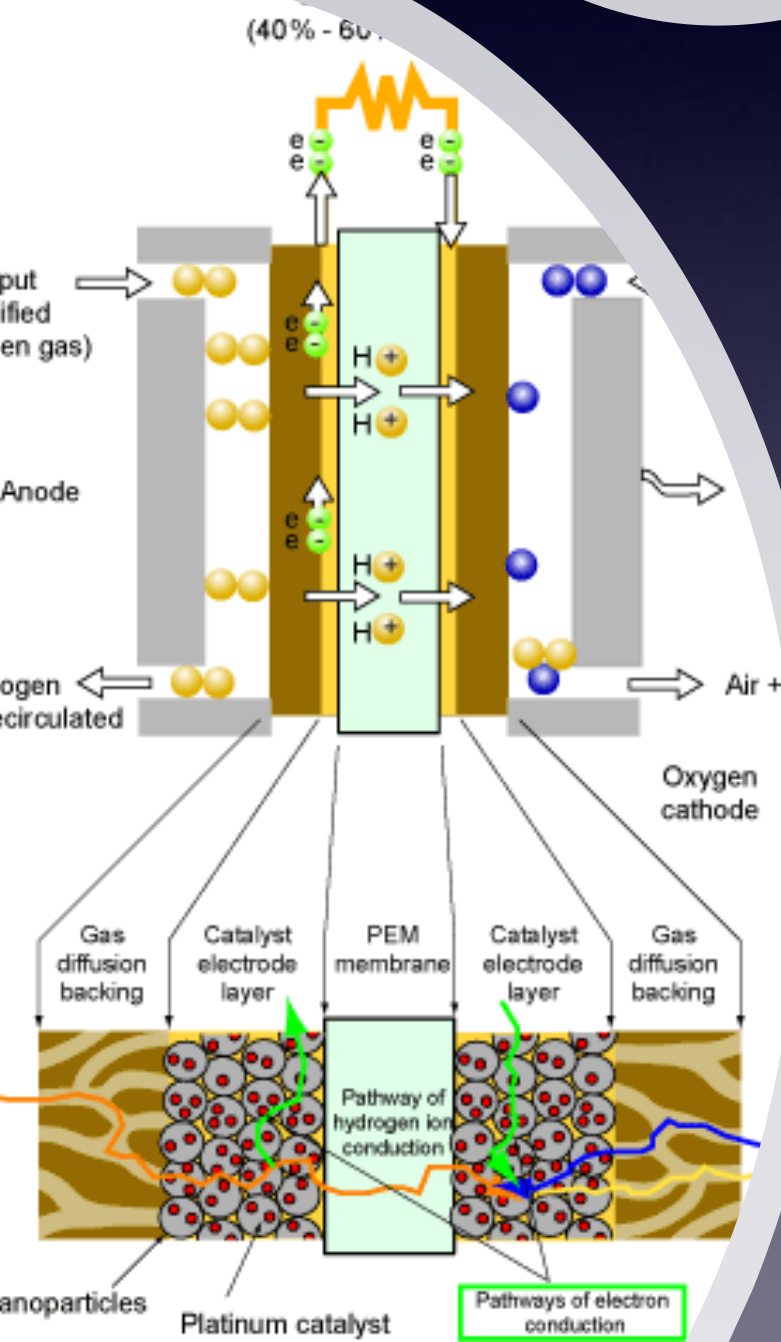
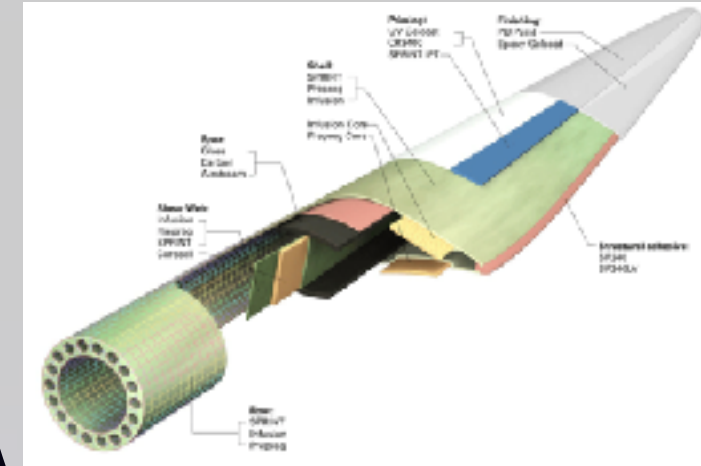
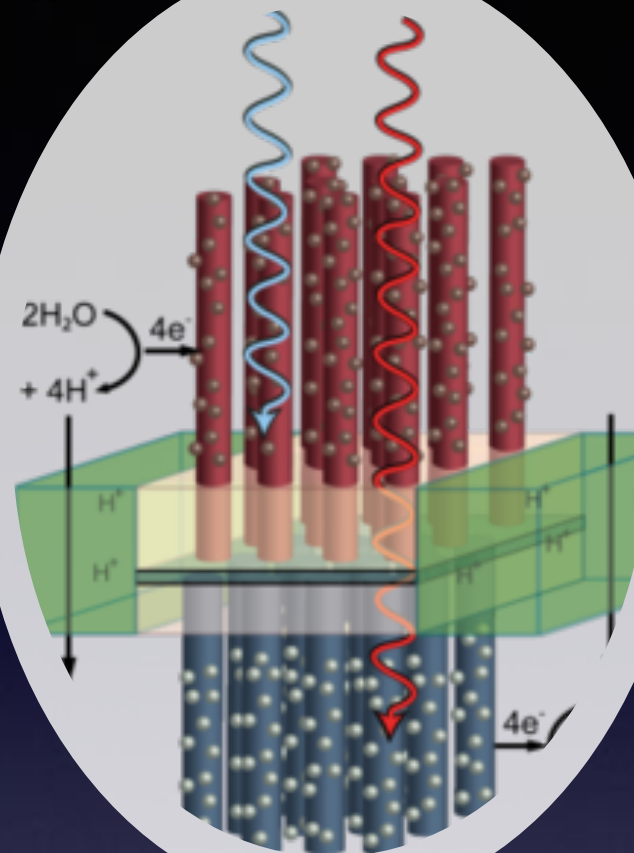
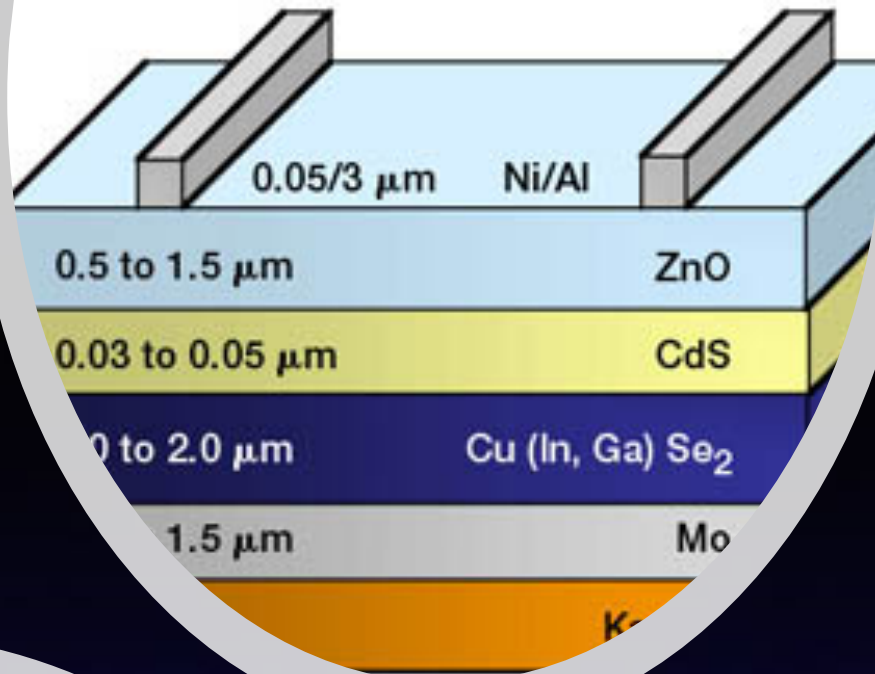


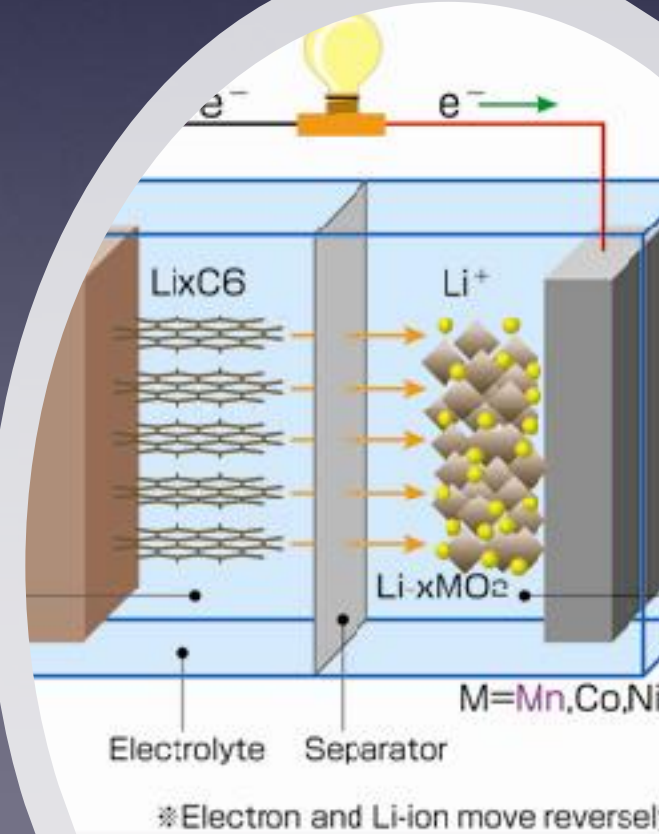
Materials Science for Energy Applications

Lecture 1 - Introduction

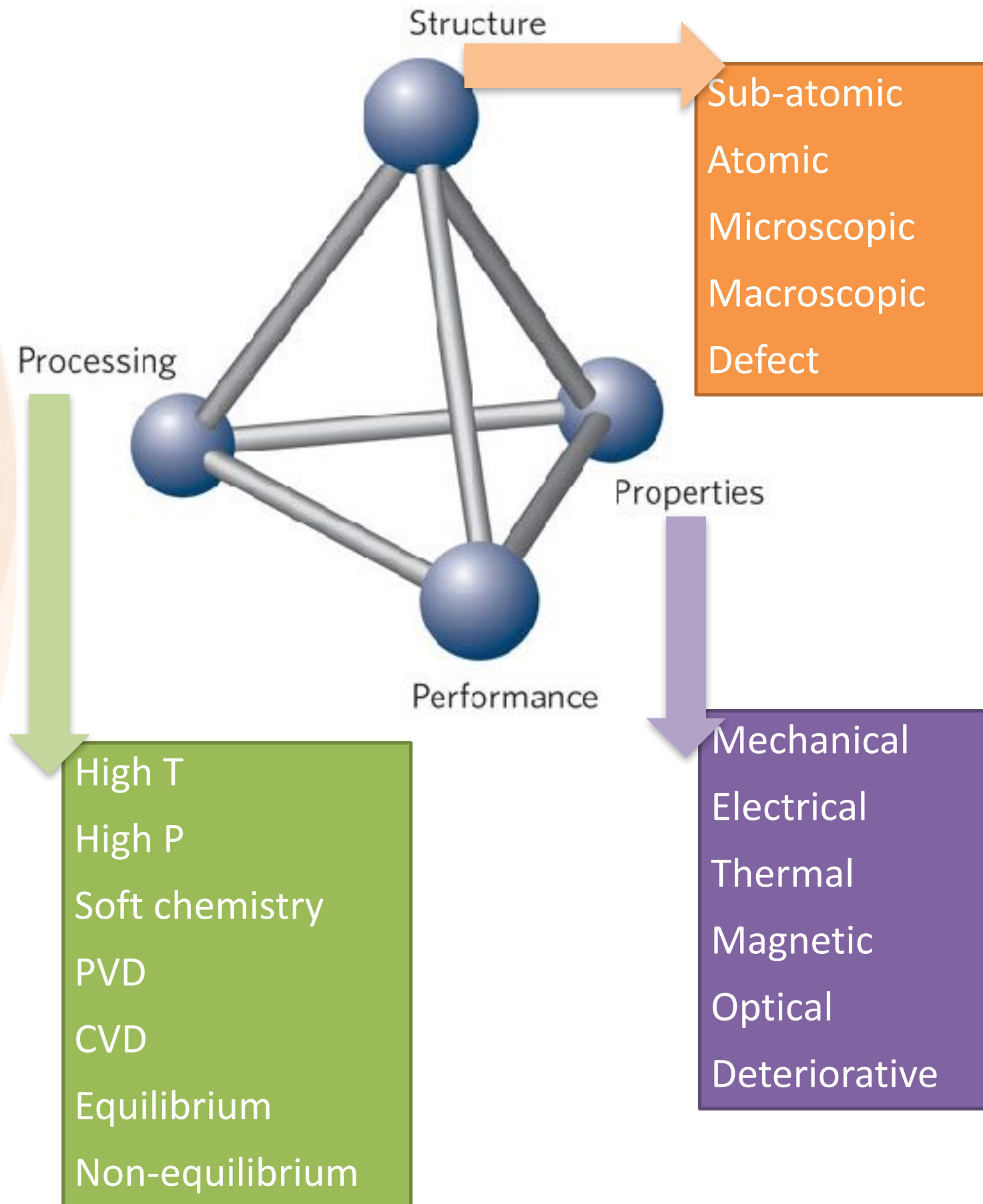




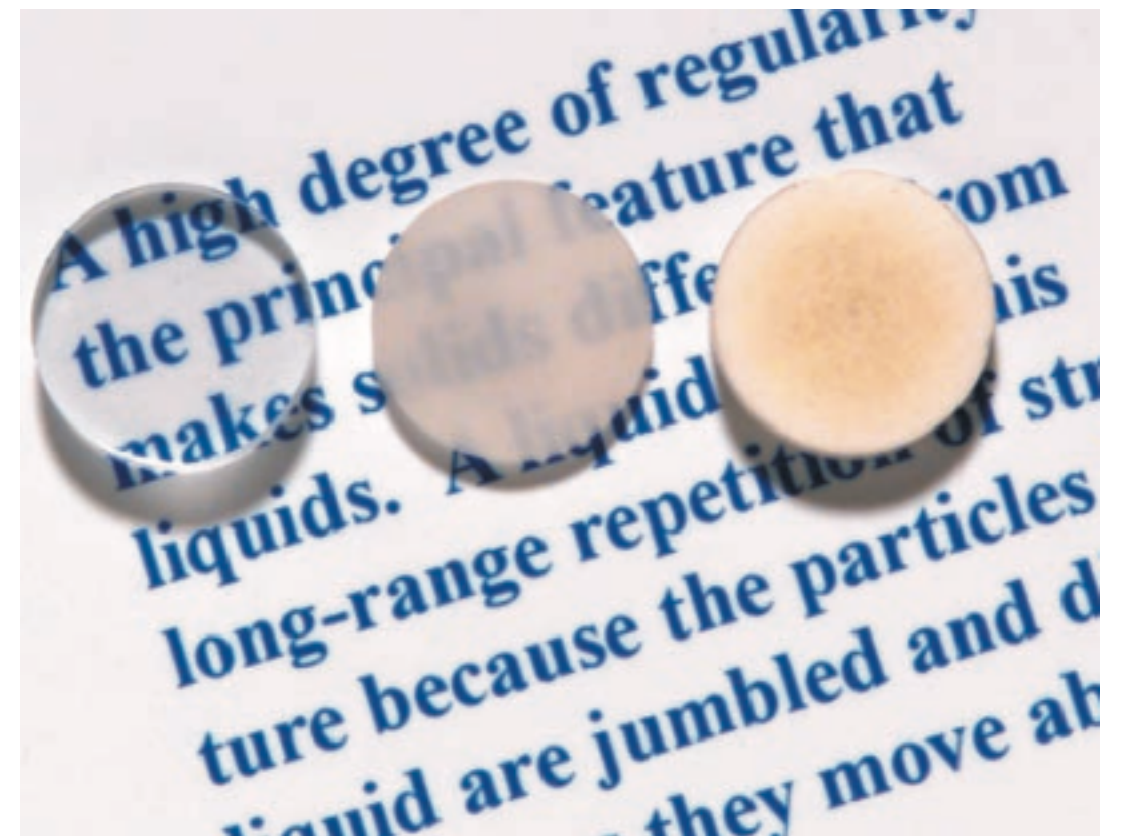
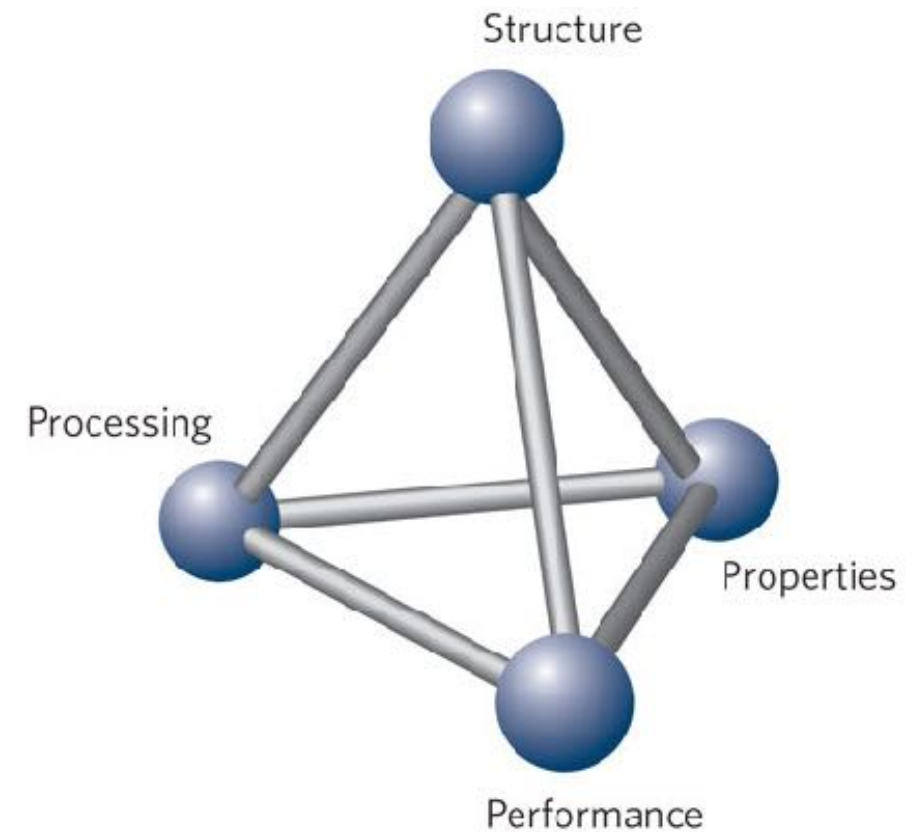
Materials Science for Energy Applications



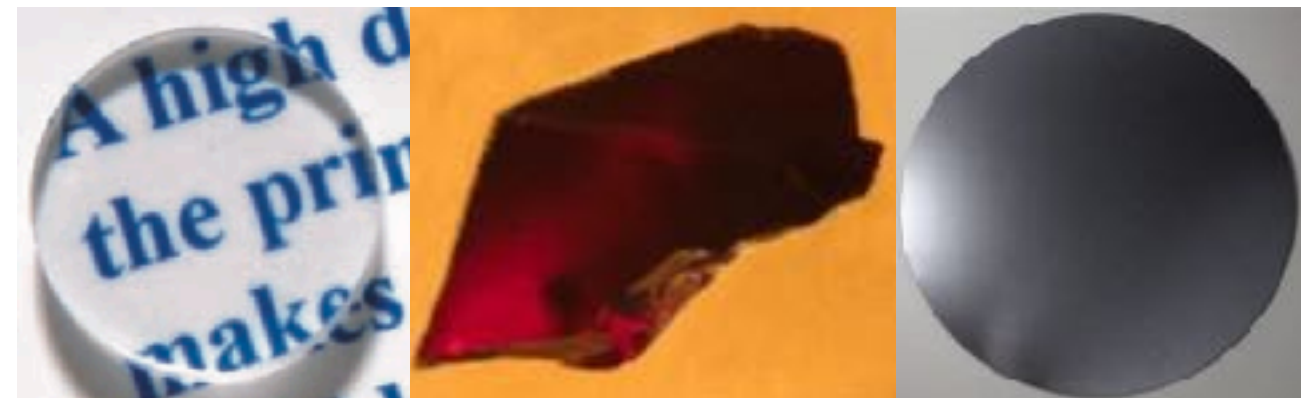
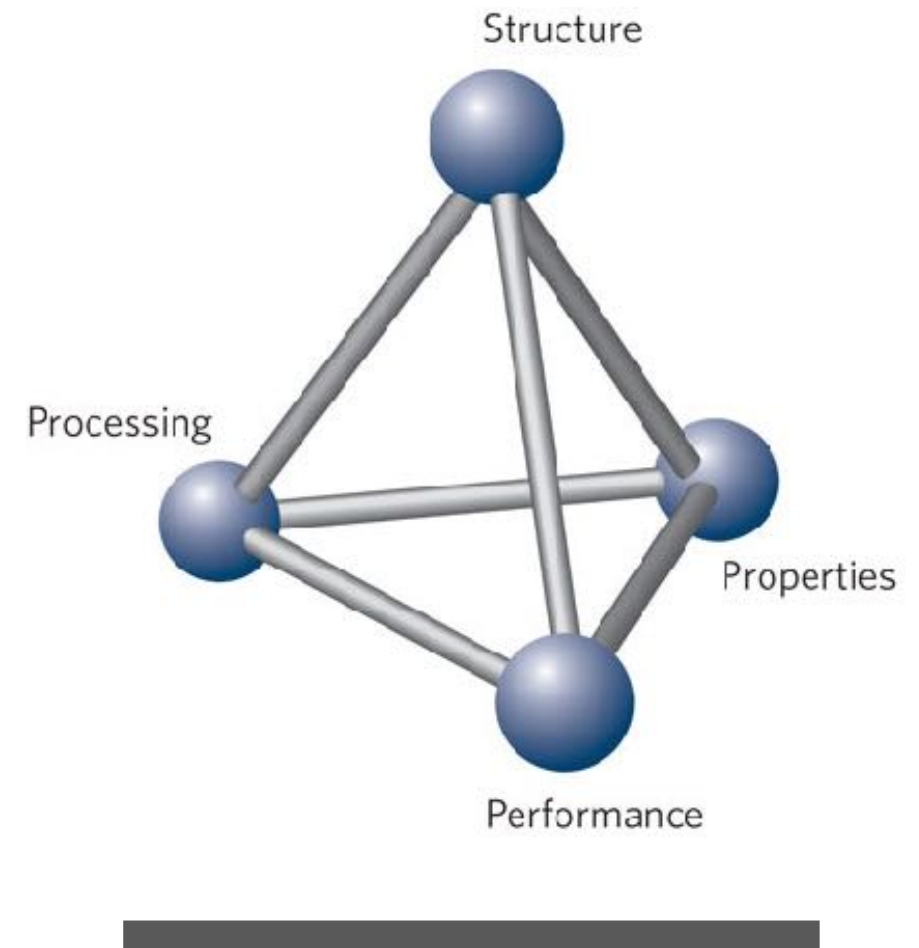
Materials Paradigm



Materials Paradigm - Example



Materials Paradigm - Example



The Course

Crystal Structures

- Lattice and motif
- Lattice and reciprocal lattice

Phase Diagrams

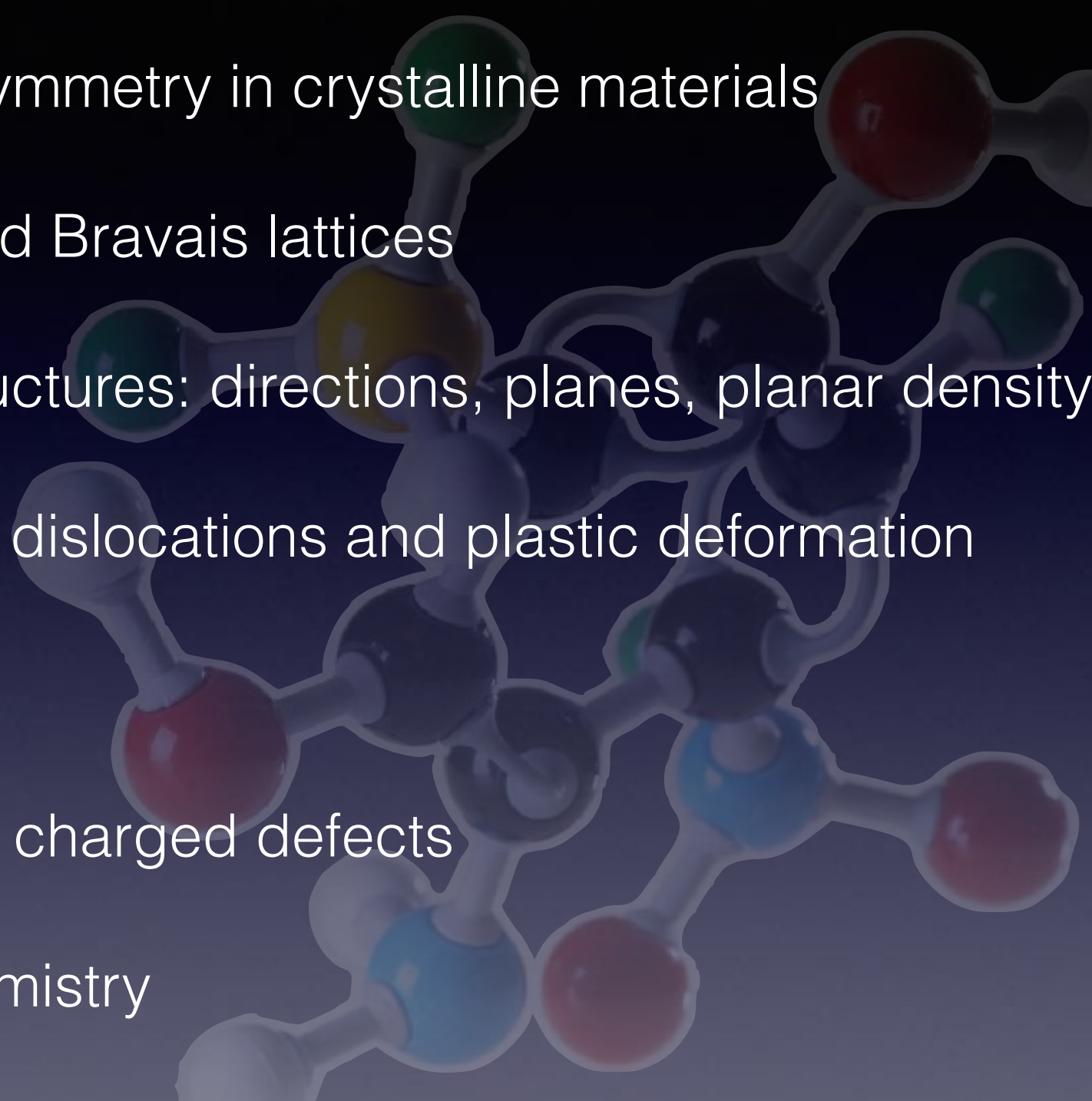
Defects in materials

- Line defects
- Point defects and defect chemistry

Electron theory of materials

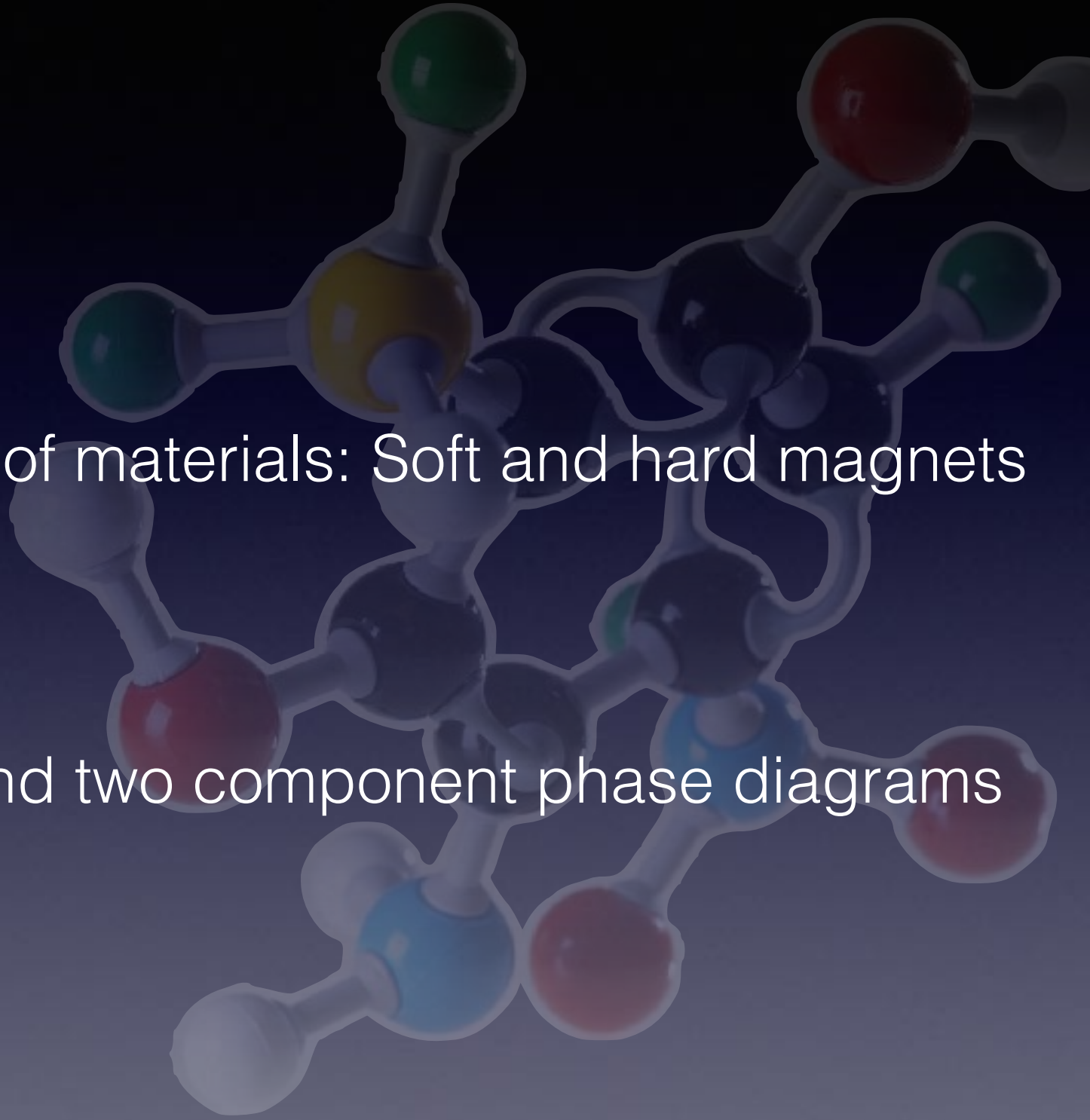
Materials in Energy Applications

Topics

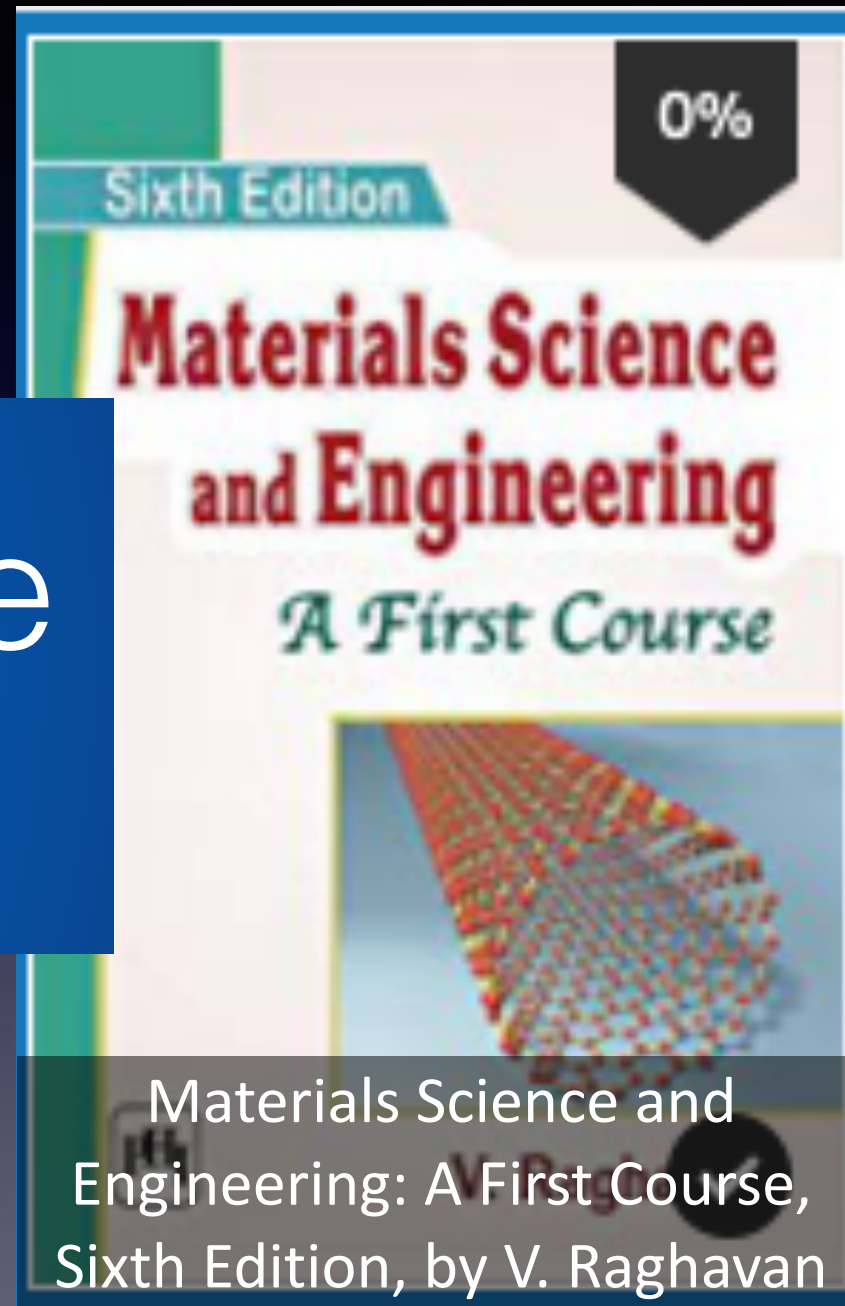
- Introduction to Materials Science and classification of materials
 - Basic introduction to symmetry in crystalline materials
 - Symmetry elements and Bravais lattices
 - Elements of crystal structures: directions, planes, planar density
 - Line defects: basics of dislocations and plastic deformation
 - Point defects
 - Vacancies, interstitials, charged defects
 - Elementary defect chemistry
 - Electron theory of materials: Simple quantum mechanics models (Kronig-Penney, Tight binding), Band theory, electronic transport in this framework, dielectric properties, optical properties
- 

Syllabus - time permitting

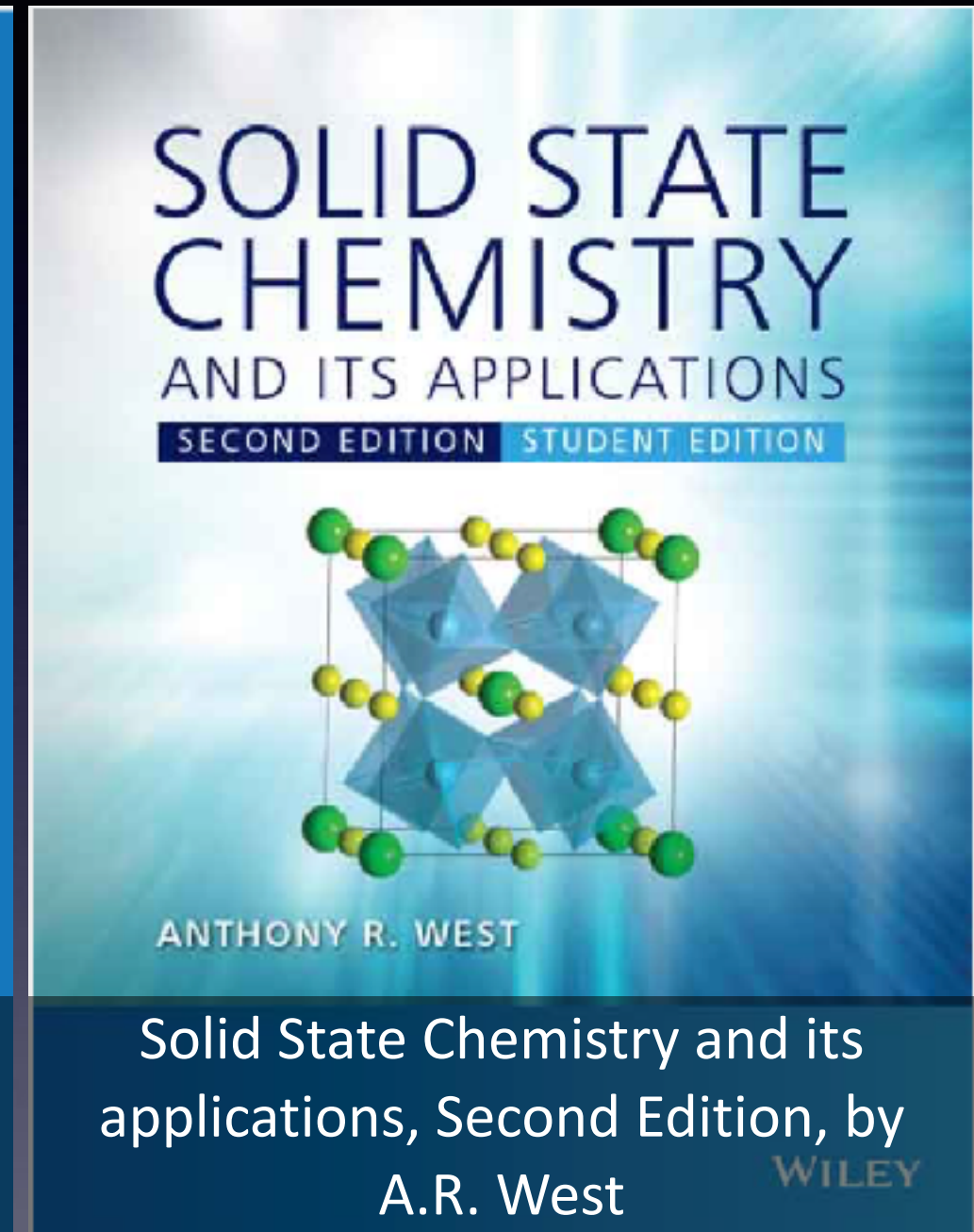
- Magnetic properties of materials: Soft and hard magnets
- Single component and two component phase diagrams



Reference books




Materials Science and Engineering: A First Course, Sixth Edition, by V. Raghavan



Solid State Chemistry and its applications, Second Edition, by A.R. West

Specific to the topics will be provided as we move along

Evaluation

- Quiz 1 (week ending Aug. 17)
 - Quiz 2 (week ending Sept. 7)
 - Quiz 3 (TBD)
 - Quiz 4 (TBD)
- 
- 24 marks
- Midsem – 20 marks (Sept. 16 to 24)
 - Endsem - 40 marks (Nov. 16 to 26)
 - Surprise quizzes and assignments – 16 marks

Assignment 1

- Select one of the following devices/items. Perform a search to determine what specific materials are used and what specific properties these materials possess for proper functioning of the device.
 - Solar PV
 - Wind turbine blades
 - Fuel cells
 - Batteries
 - Solar thermal systems
- Submit a 1 page report of your findings.