

BME341 Biomaterials



Lecture #3

Chemical Structure of Biomaterials

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Objectives of this course

- To understand the different types of bonding and how these are organized into material subunits for metals, ceramics and polymers
- To be able to compare/contrast building blocks of polymers, metals and ceramics
- Lattice parameters for simple crystal structures in metals and ceramics
- Types of defects and impurities in metals and ceramics
- General methods of polymer synthesis
- To understand the theory behind to various chemical composition characterization techniques.

Structure of Metals

Structure of Ceramics

Structure of Polymers

Structure of Metals

- Metals are crystalline
- Metallic bonding is nondirectional
- There are a wide variety of atomic configurations possible to create different crystal structures
- Crystal structures are described on the basis of their unit cells

Structure of Metals

Structure of Ceramics

Structure of Polymers

Structure of Ceramics

- The bonds in ceramics are partially or totally ionic in nature
- Crystal structures in ceramics are thought of being composed of ions rather than atoms
- The variety of chemical compositions of ceramic materials results in a wider range of crystal structures than with metals.
- Ceramic crystal structure is affected by the magnitude of the electrical charge and physical size of ions

Structure of Metals

Structure of Ceramics

Structure of Polymers

Structure of Polymers

- Polymers are macromolecules
- They can be quite big: 10^5 - 10^6 g/mol
- Polymers are organic materials consisting of long-chain molecules composed of many small repeating units (called 'mers').
- Mer: Structural entity composed of a fixed number of atoms in a given structure that is repeated over and over to form the polymer.