

● **Chapter 1: Introduction**

❖ 3 MATERIAL CLASSES:

- METALS
- CERAMICS
- POLYMERS

1. Metals:

- Solids made by metallic elements
- Metallic Bonds
- Ductile- can be deformed permanently
- Electrically and thermally conductive
- Shiny
- Highly Organized at the Atomic level- Crystalline
- Examples: sodium, titanium, chromium, iron, nickel, copper, silver, gold, lead, and roentgenium

2. Ceramics:

- Often metal oxides
- Compounds held together by ionic bonds
- Hard and Brittle- Crack instead of deforming if an increasing load is applied
- Non-Conductive thermally and electrically
- Optically transparent, translucent or opaque
- Highly Organized at the Atomic level- Crystalline, or Disorganized or *Amorphous*(Not Organized)
- Examples- sapphire (alumina or Al_2O_3), quartz (crystalline silica or SiO_2), concrete, window glass (soda lime glass)
- Less common examples or allotropes of pure carbon- diamond, graphite, buckyball, and carbon nanotubes

3. Polymers:

- Collection of Atoms held together by covalent bonds
- Ductile (Not as strong as Metals)
- Non-Conductive thermally and electrically
- Optically transparent, translucent or opaque
- Examples- polyethylene, polypropylene, polyvinyl chloride, epoxy, Teflon®, GoreTex®, and Styrofoam®.