11/12/14

Intrinsic
- Inherently conductive material → no barrier to conduct electricity
- For a material (like Si) → there are no e^- moving whatsoever
  - ↳ so increasing temperature will get e^- moving
    - YES, vibrations will reduce e^- moving, but it is not significant in comparison to e^- movement

Extrinsic
- For Si, putting a charge carrier in the material increases conductivity.

★ Affects of temperature & impurity in metals vs. semiconductors

Metals (Au, Ag, etc.)	Semi-conductors (Si)
∘ sea of electrons that freely move	∘ no free e^- moving
∘ ↑ temp significantly changes conductivity ↳ decreases because of molecular vibrations	∘ ↑ temp significantly changes conductivity ↳ ↑ movement of e^- ↳ also increases movement of molecular bonds which does affect conductivity but not significantly
∘ increase in impurities decreases an already conductive material	• increase in a type of impurity or 'doping' increases conductivity of a generally non-conductive material

Biomaterials

Seashell — Inorganic material — void — organic polymers — organism in shell

need something to connect the organic & inorganic material

↓

hydrogen bonding

Bone

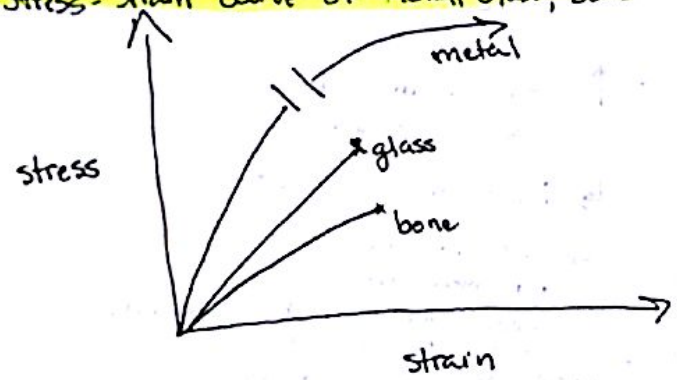
In order for a material to be implanted in the body, the human body needs to be able to recognize it.
↳ We want to be able to mimic the properties of a bone; otherwise, bad things could happen.

FOR EXAMPLE

Putting in a titanium rod into a bone.

Titanium is less ~~flexible~~ strong than bone. When weight is put on the bone/titanium, the titanium takes the bulk of the weight → causes the bone to lose strength because nerve sensors around the bone tell the body to produce less bone cells because the load is being "taken care" of by the Titanium.

Stress-Strain Curve of Metal, Glass, Bone

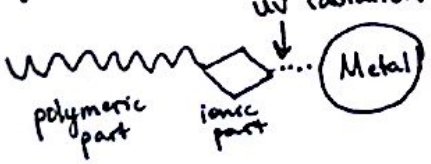


Professor Schiraldi talks about emus, stents, self-repairing paints, etc, self-healing concrete.

Biomimetics: probably a good idea to know definition

Emulate Processes in Nature
- the concept of taking ideas from nature and implementing them in another technology such as engineering, design, computing, etc.

Theory of Self Healing Polymers



→ the polymer has an ionic part which can metallo-coordinate onto a metal
→ if bond between ionic part and metal, can simply irradiate everything which allows the ionic part to recomplex w/ the metal

11/12/14

Fun Fact → I actually worked on the project that Professor Schiraldi talked about.

How a heart muscle and an elastomer alike?

→ undergoes stress-strain cycles but must maintain original dimensions.

→ like an elastomer, has regions of tightly connected bonds to make the material maintain the original dimensions and stretchy parts so the material can expand