



Classification of Materials

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Structure of solids: Classification of engineering materials, Structure-property relationship in engineering materials, Crystalline and non crystalline materials, Miller Indices, Crystal planes and directions, Determination of crystal structure using X-rays, Inorganic solids, Silicate structures and their applications. Defects; Point, line and surface defects.

CLO: Classify engineering materials based on its structure.

CLO: Draw crystallographic planes and directions.



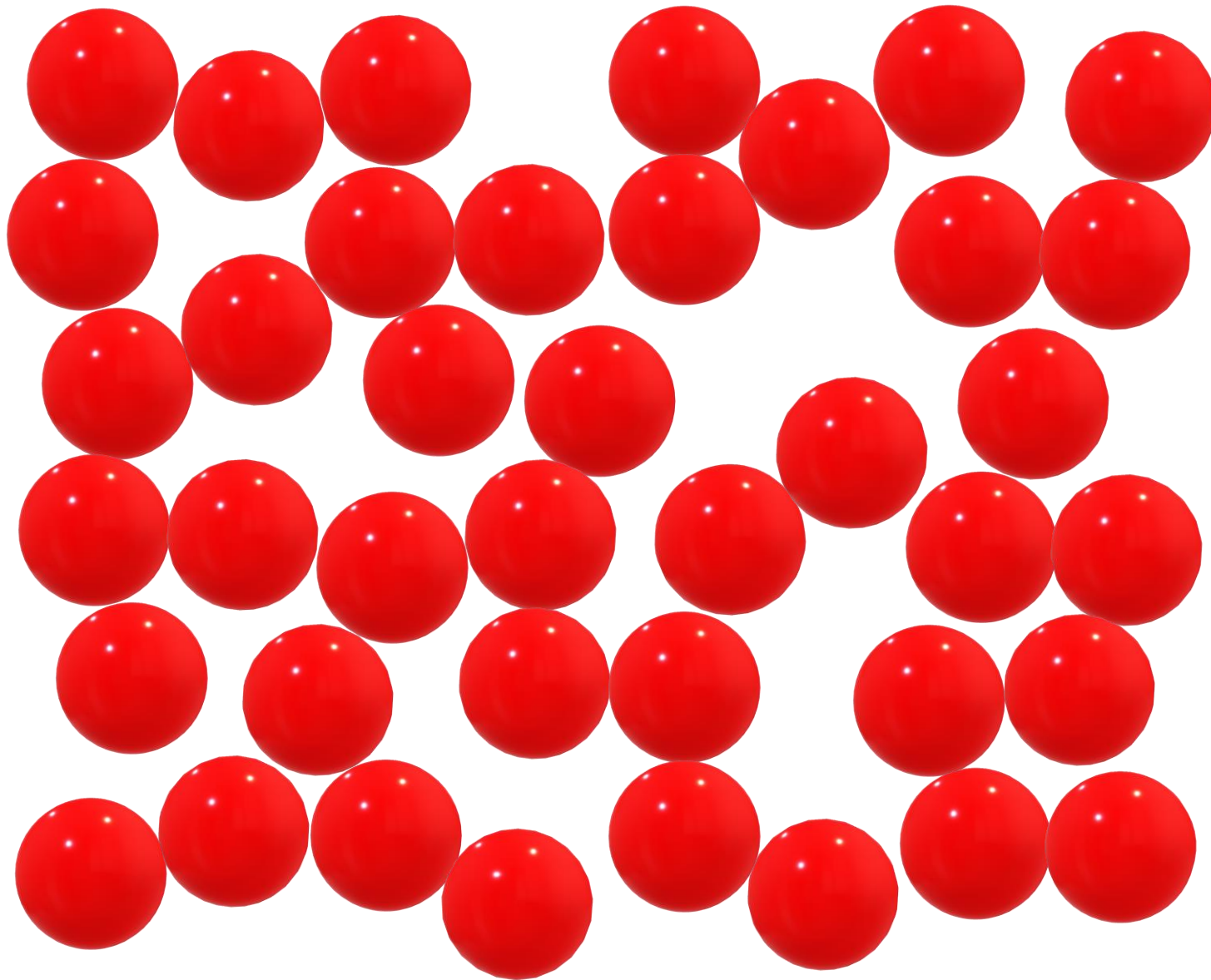
The diagram consists of three overlapping circles of a reddish-brown color. The top-left circle contains the text 'Metals and Alloys', the top-right circle contains 'Ceramics and Glasses', and the bottom-center circle contains 'Polymers'. The circles overlap in the center, creating a triangular shape.

Metals
and
Alloys

Ceramics
and
Glasses

Polymers

Particles

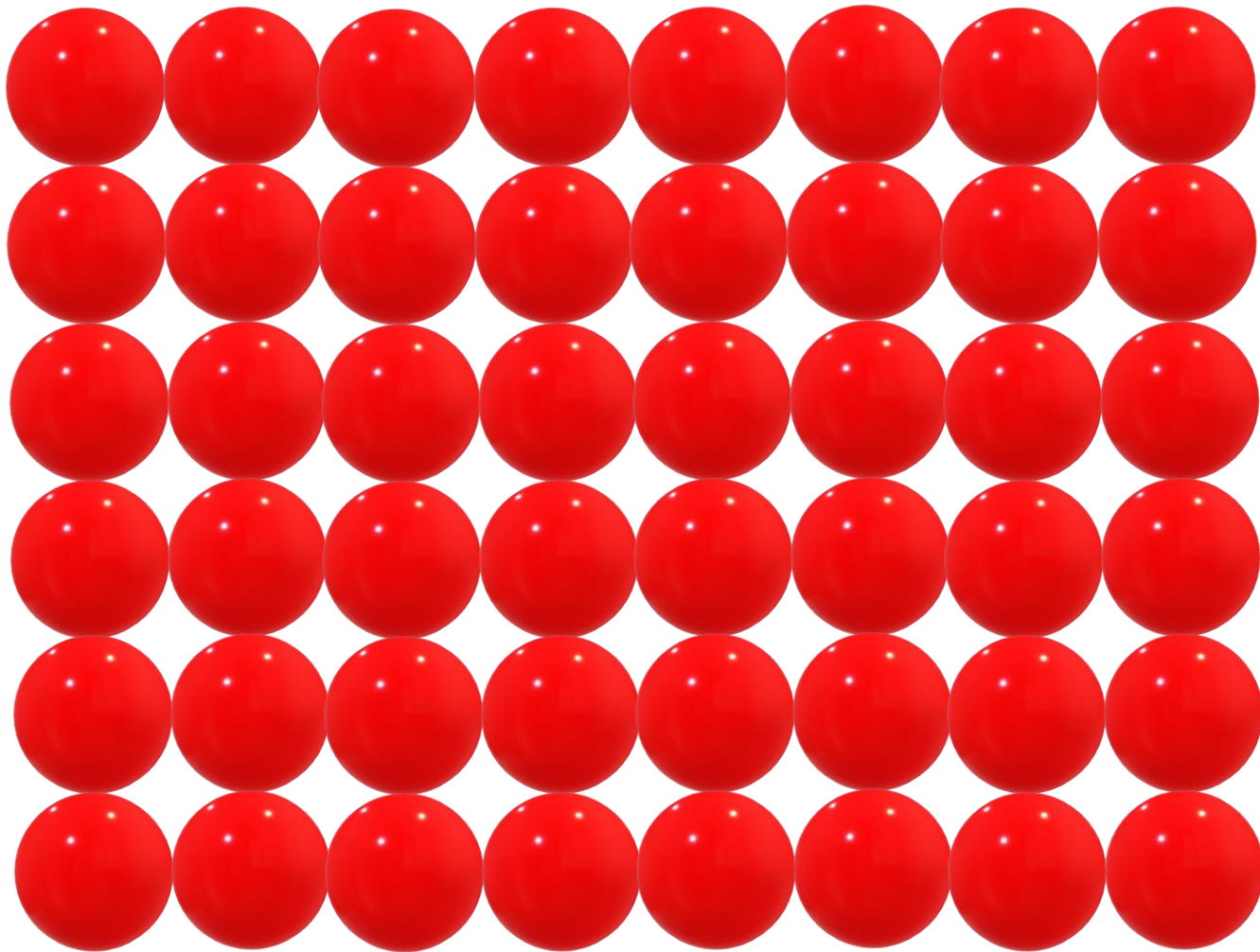


Example: Cotton candy



Generally glasses are amorphous

Particles



Example: Table Salt



Generally metals are crystalline

Metals

- Ductile
- Opaque
- Good mechanical strength
- Good conductor of heat and electricity

Ceramics

- Hard and Brittle
- Glasses are transparent/translucent
- High Melting point
- Good mechanical strength
- Bad conductor of heat and electricity

Polymers

- Ductile
- Poor tolerance to heat
- Non corrosive
- Light weight
- Low mechanical strength
- Bad conductor of heat and electricity

Metals



Metals: Cu, Ni, Fe, Au, Si, Al, Brass (Cu-Zn alloy)

Ceramics

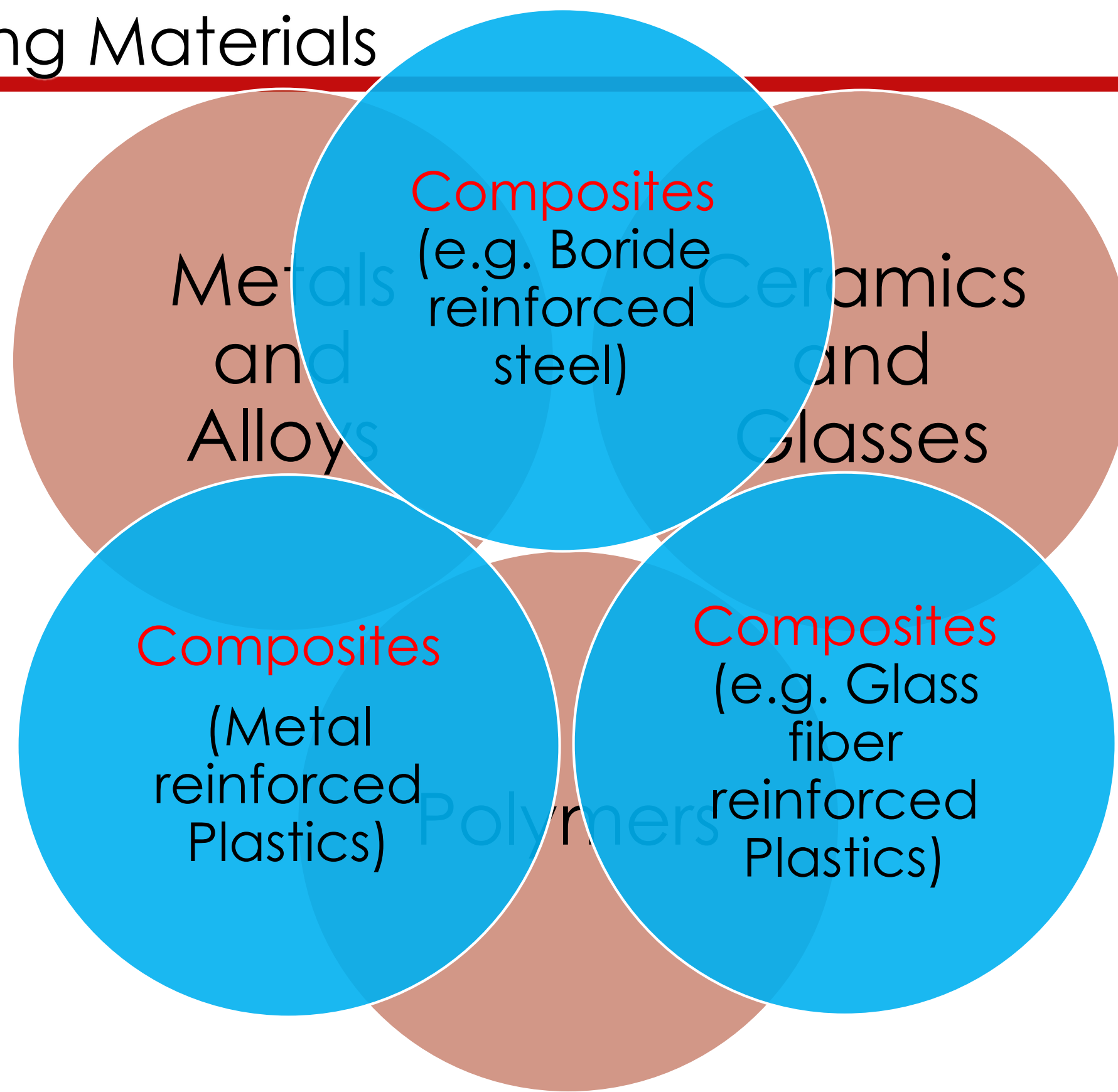


Ceramics: Usually oxides, nitrides, carbides) Alumina (Al_2O_3), Zirconia (Zr_2O_3)

Polymers

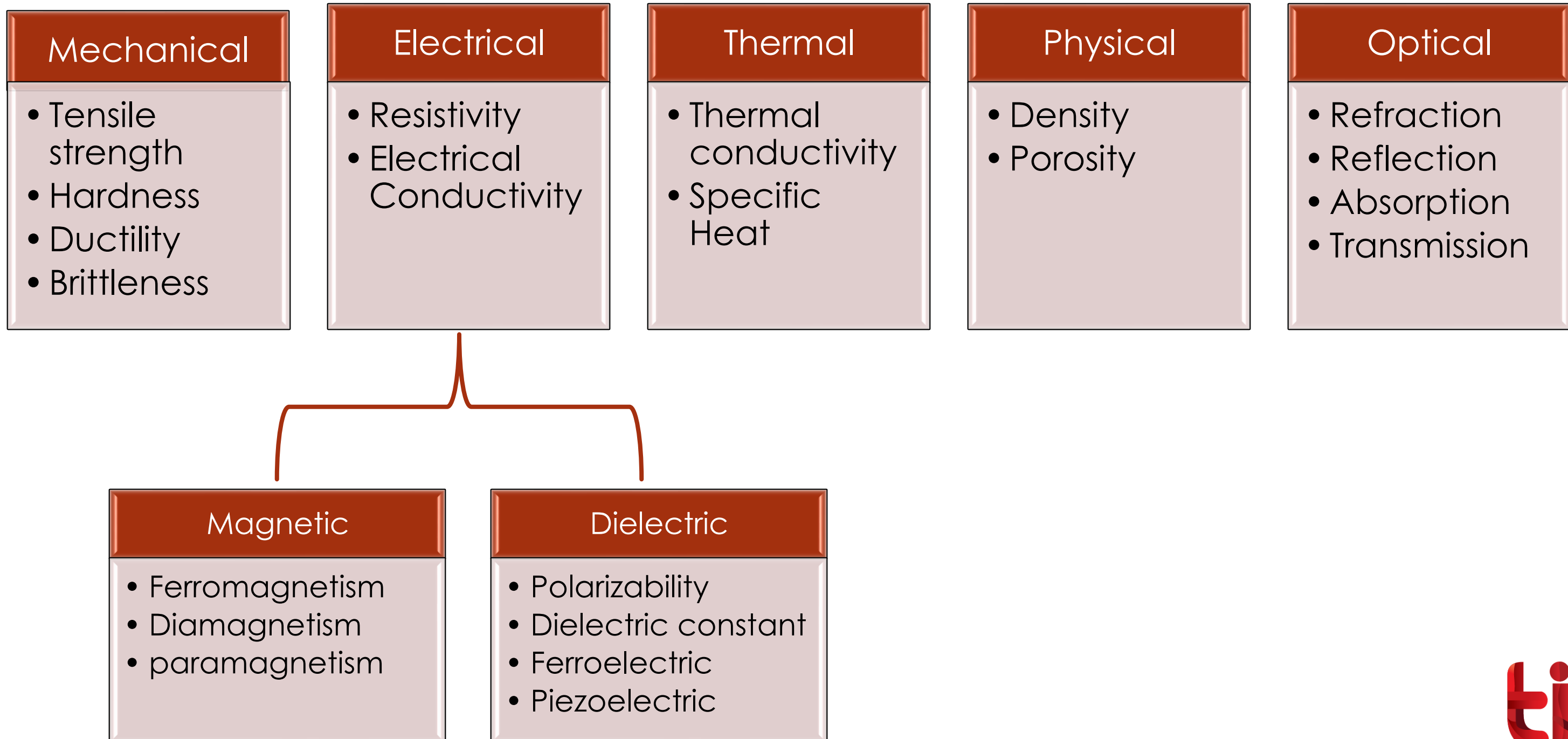


Polymers: Thermoplasts, Elastomers, Polythene, Polyvinyl Chloride (PVC), Polypropylene, Nylon



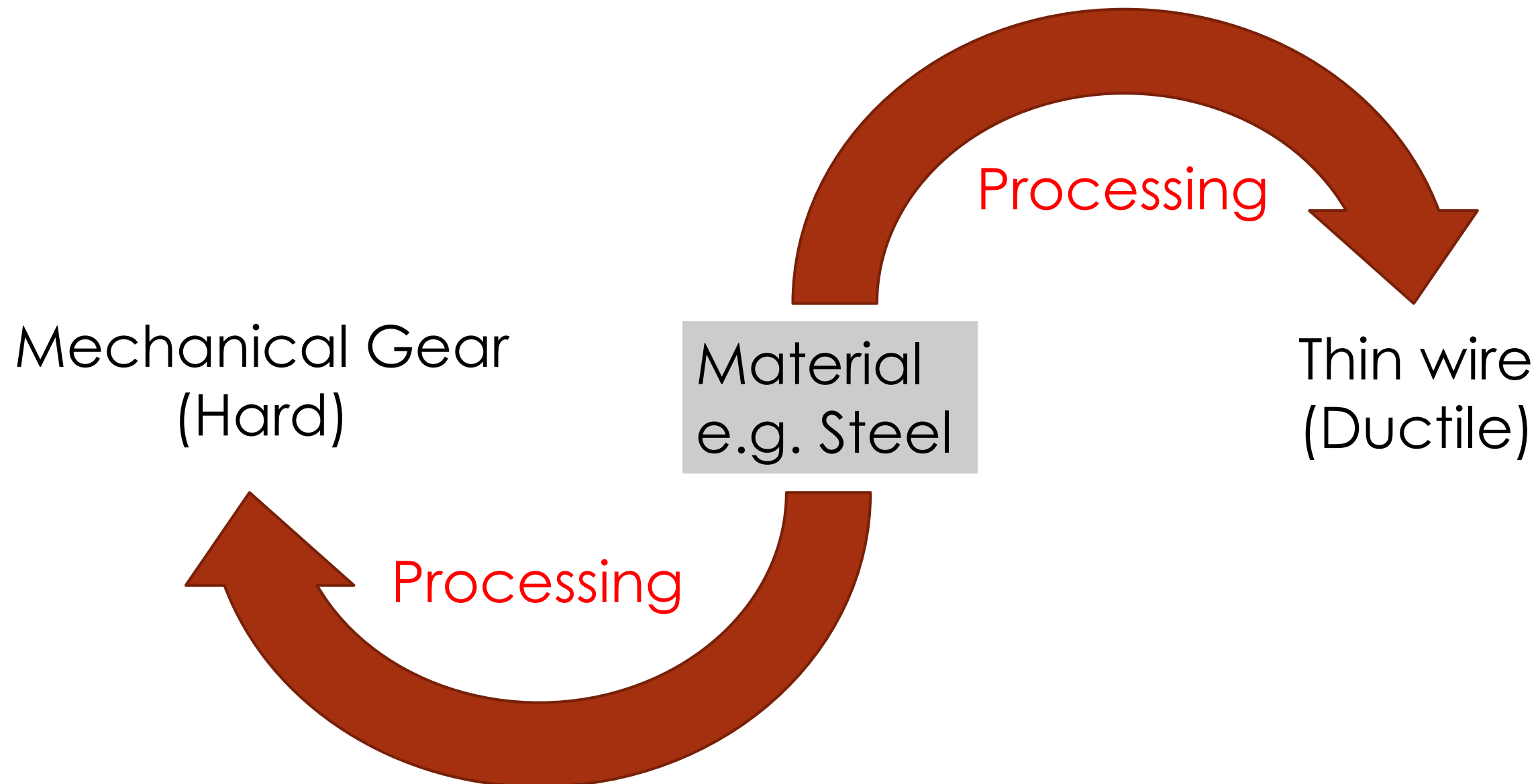
- Alloys have two or more than two metals. At least one of the elements should be a metal.
- Composites have two different material types.

Property is the response to the stimulus



Materials design approach

- Processing of material is very important to get desired properties.
- Properties are depend on the structure of the material.



1. Alloys have two or more than two metals. At least one of the elements should be a metal.
2. Composites have two different material types.
3. Response to the stimulus is called as properties.
4. Properties need specific structure for optimum performance.