Other Material Properties

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Aim of this Lesson

- For you to understand the other types of material properties other the physical properties.

Objectives of this Lesson

- For you to know about the thermal, electrical and magnetic properties of materials.
- For you to be able to identify the thermal, electrical and magnetic properties of a given material
- For you to know the effects of processing metals in particular recrystallization.

Electrical Properties

- Electrical properties are the physical conditions that allow an electrical charge to move from atom to atom in a specific material.

- These properties differ greatly between the three major types of materials

Thermal properties

- Engineers often want to know the effects of heat and temperature on a material.

The three main thermal properties of interest are:

- liner expansivity
- heat capacity
- thermal conductivity

Linear expansivity

- Is a measure of the amount by which material changes dimension with each degree rise or fall.
- It's important because it allows engineers / designers to allow for thermal expansion and contraction.

Examples would be the choice of materials used for the construction of pipe systems and railway lines.

Heat capacity

- Is the amount of thermal energy needed to raise the temperature of a substance by one kelvin.
- It is measure in unites of joules per kelvin (J/K).

Thermal conductivity

- Is a measure of the ability of a material to conduct heat.
- This is defined as the quantity of heat that will flow per unit area per second divided by the temperature gradient.

- Examples of when this would be considered would be when designing heat exchangers and boilers that need good thermal efficiency.

Magnetic Properties

- Other electrical and magnetic properties of interest to engineers are dielectric strength, which is the maximum voltage an insulator may resist before breaking down, and permeability, the ease with which a material may be magnetised.