

Mechanical Properties of Materials

Definitions

*Toughness *can be defined as* the ability *to resist / withstand* repeated bendings (adjective : tough).

*A material which can be easily drawn into wires *exhibits / possesses* the property of ductility (adjective : ductile).

*A material which easily breaks when *subjected to* impacts or elongation *is said to be* brittle (noun : brittleness).

Using the same structures, make definitions and give the corresponding noun or adjective!

- malleability - can be easily given a new shape by hammering
- hardness - resistance to scratching or indentation
- elasticity - ability to return to its original shape
- plasticity - does not return to its original shape
- stiff (adjective) - resistance to deflection, in the case of springs
- density - ratio between mass and volume
- fusibility - the material can easily melt

Look at the following table!

	Temperature	Cooling	New properties
annealing	800 C	very slow	ductile + soft +
tempering	250 C	quenching = immediate cooling in oil or water	tough + ductile+ hard -
hardening	800 C		hard +
normalizing	800 C	slow	hard + ductile -

a) When /if normalized, steel acquires / gains increased hardness and decreased ductility.

→ *Make similar sentences with the other three operations!*

b) annealing :

* **after** the metal is heated (= after heating the metal) up to 800 C, it is very slowly cooled down.

* **before** the metal is very slowly cooled down (= before very slowly cooling the metal down), it is heated up to 800 C.

→ *Make similar sentences for each of the other three operations!*

Transform as in the example :

If we add chromium to steel, corrosion-resisting properties are improved.

→ Adding chromium to steel *results in / brings about* improved corrosion-resisting properties.

-If we add nickel to steel, ductility and toughness are increased.

-If we quench a piece, hardness and strength are improved.

-If we anneal steel, ductility is increased.

-When we use tin to coat another metal, corrosion-resisting properties are enhanced (= improved).

-If we vary the proportion of carbon, steel will possess quite different properties.

Transform as in the example :

If you add chromium TO steel, it'll resist corrosion.

→ Steel TO WHICH chromium is added will resist corrosion.

-If you incorporate chromium INTO steel, it'll withstand corrosion.

→ Steel...

-If you apply a high load TO a piece, it'll break.

→ A piece...

-If a rivet is submitted TO a shear force, the latter can break the rivet.

→ A shear force ...

-If you exert a tensile force ON an elastic material, it'll return to its original shape.

→ An elastic material ...