Sean Storey

1)

For the packaging of a snack product the requirements for the material must be printable and machinable. They must have a seal integrity to protect the product ~~away~~ from entry of air or liquid and damage the product. It must be strong to not break under pressure if the product has to be vacuumised.

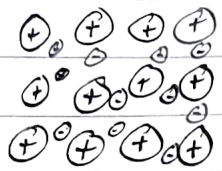
Flexible plastics could be used with laminated structures to avoid acids being absorbed and damaging the packaging.

Composite containers can be used with a foil laminated coating. The inner face can be coated film to ensure protection against moisture.

Plastics do have an effect on the environment because certain plastics cannot be recycled.

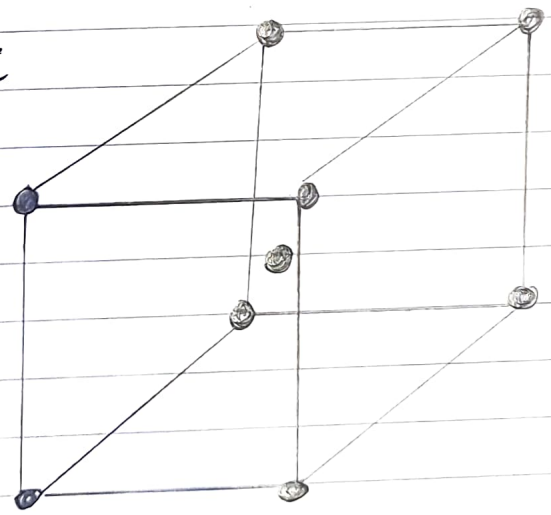
2) Sean Storey

a) metalic bonding is the attraction between the positive ions in the lattice and the delocalised electrons.



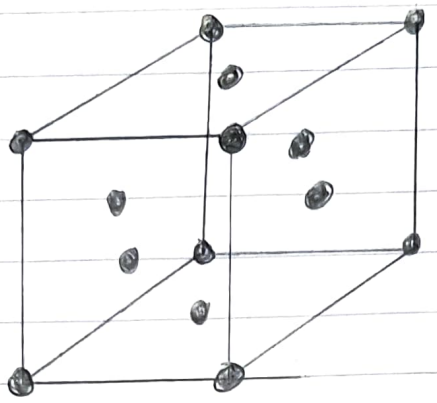
Metals with a valency of 2 are generally stronger because the are more electrons to cause a tighter bond.

b) BCC

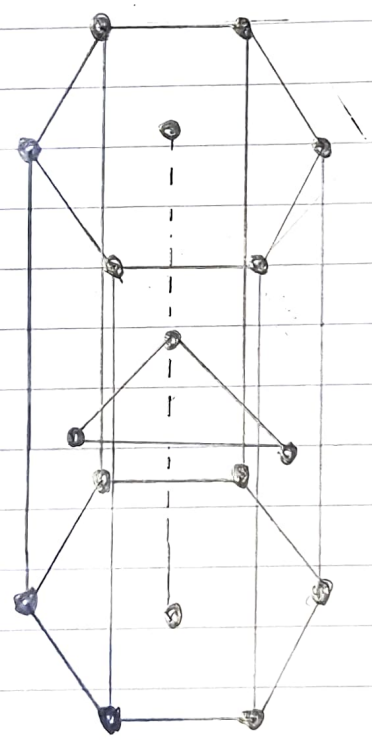


Sean Storey

FCC



HCP



Seen Story

c) The packing ratios are:

HCD = 0.74
BCC = 0.68

d) The State of the mixture at 1800 degrees is a liquid.

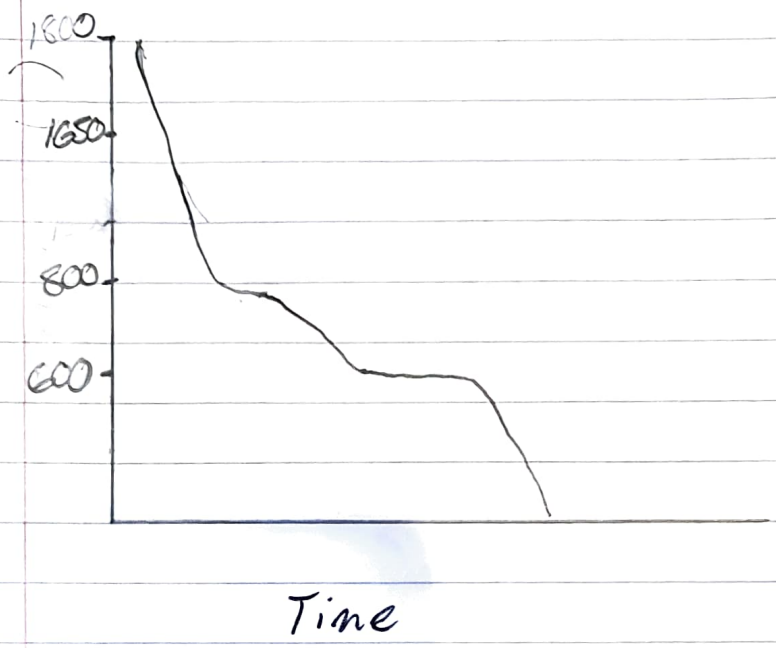
At 1650 degrees the State of the mixture is Still a liquid.

The State of the mixture is a Solid and is Ti_2Ni at 800 degrees

The mixture at ~~600~~ degrees ~~is~~ Remains a Solid and ~~is~~ is Ti_2Ni.

Sean Storey

e)



Sean Storey

3)

a) The classes that should be considered are ceramics, metals, composites and natural materials.
- Ceramics are very high in stiffness and low in density
- Metals are high in stiffness and have a slightly higher density compared to ceramic but is suitable
- composits have a high stiffness and a lower density than metals
- natural material have very low density and a suitable stiffness

b) The classes to not consider for practical reasons would be;
- natural materials, because they are flammable.
- Ceramics, because they are brittle and would break with collision
- metals, because they are too heavy and would slow the car down
- composites, because they are very hard to machine

Sean Storey

c)
carbon fiber is used on race car chassis because it is super ~~lig~~ lightweight and very strong and stiff. It can also be molded into all different types of shapes very ~~easily~~ easily.

Steel space frames are rigid and lightweight. They are strong because of the inherent rigidity of the triangle. Flexing loads are transmitted as tension and compression loads along the length of each strut.

d) welding will reduce the fatigue life on steel because it exceeds the melting point of the base material.

Brazing is deemed higher because it does not melt the base material. the heat source melts the filler and creates a metallurgical bond between the filler metal and base metal.

Sean Storey

e) riveting, requires less skill to get it correct, but it does take longer and will add to the weight.

Fasteners, does not take long to do and requires low level of skill. But is not as strong as welding.

4) Sean Storey

a) Scuba diving cylinder contain large amounts of compressed air and their requirements of material must be low in density to not weigh the diver down. It must have a high yield strength to contain the air pressure and water pressure when diving to high depths. The material must be resistant to chemical corrosion when diving into salt waters.

b)

6062 T6 Aluminium has a very low density and has a high hardness, it also has a high fatigue strength and yield strength

Steel alloy 1020 has quite a high density and lower yield strength which would be heavey for the diver when in water

304 ~~Storage~~ Stainless Steel is high in yield strength but still high in density but has an excellent corriosion resistance which would be effective in water.

Pre-pregnated carbon fibre is extremley high in yield strength and very low density which might cause the diver to float

Sean Storey

b) My personal choice would be 304 Stainless Steel because the yield strength is high an the density would keep me below water.

c)

$$\sigma = \frac{Pd}{4t}$$

$$t = \frac{2Pd}{\sigma_{yield}}$$

d) i)

$$t = \frac{2 \cdot Pd}{\sigma_{510}}$$

$$t = \frac{2 \times 20 \times 100}{510}$$

$$= 7.84$$