

Tamzyn Davis

ACHA6012

13/5/22

Automotive materials and sustainability

Section A:

1)

Aston Martin created a Rapid S car for debut at the nürburgring in 2013. it is a hydrogen car that is 30% more efficient than its gasoline sibling. under regulations hydrogen power would be classed as a zero emission vehicle. hydrogen powered vehicle ~~reduces emissions~~ can run 100km - 200km between fills which is further than current hybrid-electric cars. the infrastructure needed for hydrogen cars would be extra pumps at stations or purpose built stations for hydrogen. Storage of hydrogen is difficult so storage buildings are needed and transport to stations would also be an issue to be addressed.

Audi is developing a bio fuel that ~~used~~ uses the photosynthesis process in algae to create fuel. the waste CO₂ from steel works production is used with the primary energy input is sunlight. the infrastructure needed for this system is very low as no agriculture fields are needed and current fuel plants could be converted to create this fuel.

kinda care, kinda don't

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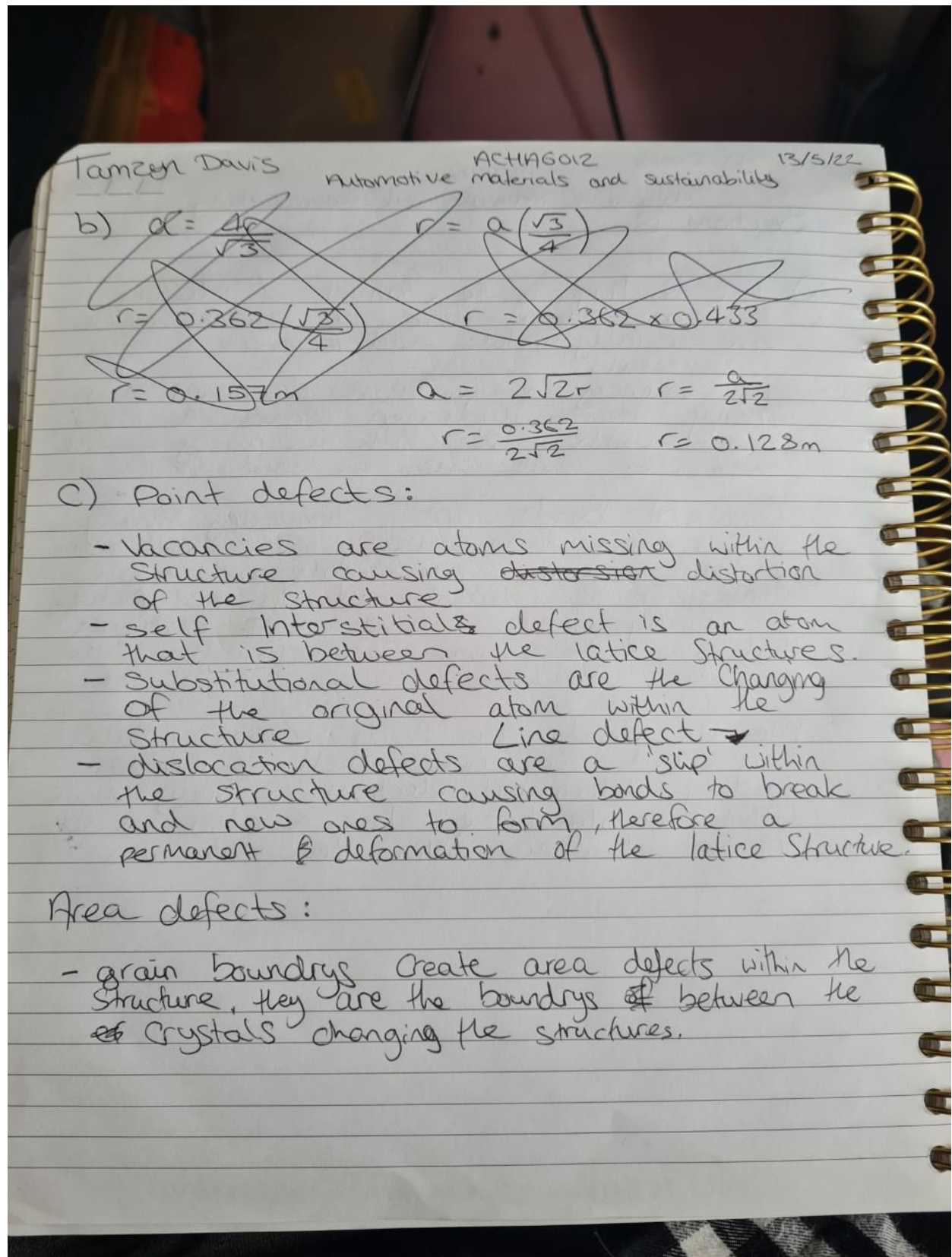
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Section B:

a) Ionic Bonding is the ^{Permanent} transfer of electrons between atoms. These are donors, which are usually metals, and receivers, usually non-metals. The valency of the atom determines how many ~~atoms~~ hydrogen atoms it can bond with. Atoms with a nearly complete ~~outer~~ outer shell want to bond for completion.

Covalent bonds are a temporary sharing of electrons, this usually occurs with non-metals however, non-metals and metals can have a covalent bond. In non-metals it usually occurs between ~~atoms~~ elements that are the same or close on the periodic table.

Metallic Bonds are bonds between metals, they shed the outer shell of electrons causing delocalised electrons to freely move within the structure. There is also no set amount of atoms within these structures.

not today... and maybe not tomorrow



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- d) protecting creep in the second phase can be controlled using grain size changes. the crystalline structure settles within the grain boundaries under load. the finer the grain the better the structure.

4)

a)

- i) 7xxx ~~al~~ aluminium's main alloying element is zinc.

Zinc alloying can be made stronger with heat treating however, this alloy becomes very brittle.

- ii) the numbers within Steel 1045 tell us what type of alloy and how it is modified. 1 shows that it is a Carbon steel, the 0 shows it has not been treated (modified) and the 45 shows it is a 0.45% Carbon content.

- b) Particle reinforced has 2 groups, large particle and dispersion strengthened. large particle does not refer to the size of the particle but refers to the interaction not being on the atomic level. dispersion strengthening is smaller particle size and forms bonds on an atomic level.

busy doing nothing

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- b) fiber reinforced has 3 structure types:
- aligned fibers transfers load longitudinally allowing for high strength in direction of fibers
 - random fibers does not have the same strength of aligned fibers but is easier and cheaper to produce.
 - woven fibers has a higher strength than random fibers but a lower strength in a single direction. this fiber is very expensive to produce.

Structural

- laminar composites are made up of sheets of materials, they can be placed directionally giving ~~more~~ the material properties desired.
- sandwich panels have a core made of less dense material and the faces sandwiched are a dense strengthening material.