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ENGR 145 Fall 2023
Homework Set #1
Due Thursday, Sept. 7, by noon
(TAs will instruct on how to submit)

CR Ch. 1, Question 1.1 (choose one of the items)

CR Ch2: 2.6, 2.10, 2.23, 2.24, 2.25.

Thought question: There are three main types of beverage container materials: aluminum, plastic, and glass. In your opinion, which is the most environmentally-friendly?

In my opinion, alluminum is the most environmentally friendly. This is because of how much modern electronics rely on alluminum bodies. Alluminum is completely recyclable, allowing it to be reused for phones, laptops, tablets, etc. Plastics do not degrade and are not found naturally and glass is being replaced in many cases, screens/eyewear. Alluminum's versatility is what makes it the most environmentally friendly.

ENGR145 HW 1

1.1) Solar cells are playing a big role in moving towards renewable energy, and the materials needed to construct them are being studied and optimized constantly. Silicon is the most important material in solar cells. It makes up the semiconductors that generate the actual electricity. Silicon is sodered together in a matrix like structure to convert the suns rays into energy using the photovoltaic effect. Silicon is used for this because it is so efficient with energy conversion. Alluminum is typically used in the metal frame because it is a lighter metal that still protects the cells from harsh climates and is useful for mounting panels. The final main component of solar cells is a glass sheet that is typically 6-7 mm thick. The glass holds an insulating casing and a protective sheet that limits heat, as increasing heat decreases efficiency. The glass also limits humidity while still allowing the suns rays to be captured by the solar cells. All of these materials combine to make a cheap yet effective and long lasting product.

Source(s)

https://news.energysage.com/what-are-solar-panels-made-of-list-of-solar-pv-materials/

https://www.energy.gov/eere/solar/solar-photovoltaic-cell-basics

2.6) a) The Bohr model showed the important Quantum principle that electrons exist in discrete orbitals that define its position. The other principle illustrated by Bohr's is that electrons have quantized, or set, energy levels and cannot assume others.

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b) The wave mechanical model took Bohr's ideas and improved/corrected them. It found that an electron's position is determined by a probability field around the nucleus. Another important concept found by this model is that electrons exhibit both wave-like and particle like characteristics.

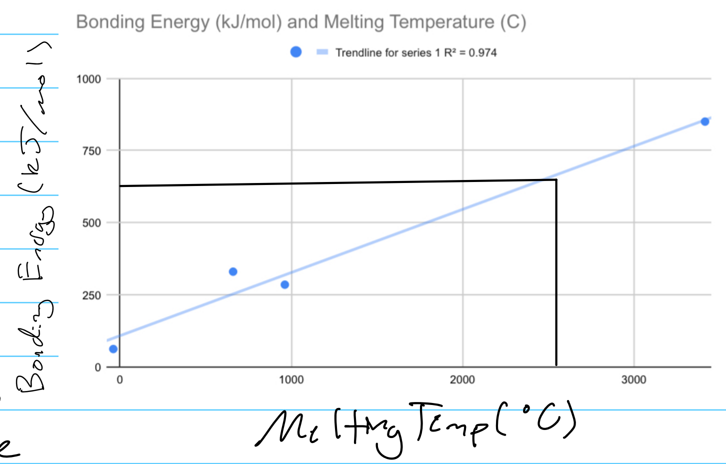
2.10) KI – K^+ and I^-

K^+ has one less e^- than K, meaning it shares an electron configuration with Argon

I^- has one more e^- than I, meaning it shares an electron configuration with Xenon

2.23)

2.23 Make a plot of bonding energy versus melting temperature for the metals listed in Table 2.3. Using this plot, approximate the bonding energy for molybdenum, which has a melting temperature of 2617°C.



In General, Melting Temp. Increases as Bonding Energy increases. As shown by the graph and the line of best fit, it is predicted that Molybdenum (2617°C) will have a Bonding Energy of about 625 kJ/mol

2.24) HF has a higher BP than HCl because HF exhibits H-bonding while HCl does not. H-bonding is the strongest secondary bond, and it does not occur with HCl. Despite the molecular weight difference, HF's bond strength outweighs HCl's, requiring more energy to boil.

2.25) MgO $\%IC = \left(1 - e^{-.25(3.5-1.2)^2}\right)100$

$= 73.553\%$

GaP $\%IC = \left(1 - e^{-.25(2.1-1.6)^2}\right)100$

$= 6.059\%$

CsF $\%IC = \left(1 - e^{-.25(4-.7)^2}\right)100$

$= 93.429\%$

CdS $\%IC = \left(1 - e^{-.25(2.5-1.7)^2}\right)100$

$= 14.786\%$

FeO $\%IC = \left(1 - e^{-.25(3.5-1.8)^2}\right)100$

$= 51.446$

Electronegativity values found on pg. 27