

Electrolysis

Guidlines

Non-metal at anode

metal at cathode

If halogen present -> anode

Cathode -> least reactive *metal*

OH^- at anode -> $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$

Metal Purification

Thin pure Metal at cathode

Thick impure metal at anode

Electrolyte soluble salt of metal

Metals

Iron Extraction

raw materials: coke(C), Hot air, Limestone(CaCO_3)

1. $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

2. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

3. $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$

4. $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ (700 celcius)

5. $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$ (slag)

Acid, Bases and salts

Neutralization Reaction

Acid + Base -> Salts + Water

$\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{lq})$

Rules

- All Nitrates are soluble
- all sodium, potassium, ammonium salts are soluble
- all chlorides are soluble except *lead* and *silver*
- all sulfates are soluble except *Barium*, *calcium*, *lead*
- all carbonates and hydroxides are insoluble

Methods

acid + metal -> salt + hydrogen (*MAZIT* metal)

acid + carbonate -> Salt + water + carbon Dioxide

Titration: acid + alkali -> salt + water (reactive metals)

acid + *insoluble* base -> salt + water(unreactive metals)

Precipitation(insoluble): Soluble salt + Soluble salt -> insoluble salt + soluble salt

- example: Barium Chloride + Sodium Sulfate -> sodium chloride + barium sulfate

Organic Chemistry

All Organic Compounds

Combustion: organic compound + oxygen -> carbon dioxide + water

Organic Chemistry (cont)

Alkanes

Substitution Reaction: Alkane + Chlorine -> Chloroalkane + Hydrogen

-example: $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$

Cracking: long alkane -> shorter alkane + alkene

-example: $\text{C}_{12}\text{H}_{26} \rightarrow \text{C}_{10}\text{H}_{22} + \text{C}_2\text{H}_4$

Thermal Cracking: Catalyst- Broken Unglazed Pottery

Catalytic cracking: 550 degree cel and chromium oxide catalyst

Alkenes

Hydrogenation: alkene + hydrogen -> alkane (200^{deg}, nickel)

Hydration: alkene + steam -> alcohol (300^{deg}, 6000^{kPa}, Phosphoric(V))

halogenation(alkene Test): alkene + bromine -> dihaloalkene (brown)

Alcohol

Oxidation: ethanol + oxygen -> ethanoic acid + water (Pottasium Mang)

Fermentation: glucose -> ethanol + carbon dioxide(yeast)

Carboxylic Acid

ethanoic acid + sodium hydroxide -> sodium ethanoate + water

$\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

ethanoic acid + magnesium -> magnesium ethanoate + hydrogen

$2\text{CH}_3\text{COOH} + \text{Mg} \rightarrow (\text{CH}_3\text{COOH})_2\text{Mg} + \text{H}_2$

ethanoic acid + sodium carbonate -> sodium ethanoate + carbon dioxide

$2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$

Chemical Reactions

Haber Process

$\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$

Conditions:

- 20000 kPa

- 450 celcius

- Iron catalyst

Contact Process

$2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$

Conditions:

- 200 kPa

- 450 celcius

- Vanadium(V)oxide

Chemistry Of the environment

Test For Water

- anhydrous copper(II)sulfate turns from *white* to *blue*

- Cobalt(II) Chloride Paper turns from *blue* to *pink*

- impure water has higher boiling point

Catalytic Converter

$2\text{NO} + 2\text{CO} \rightarrow \text{N}_2 + 2\text{CO}_2$



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Published 10th December, 2023.
Last updated 18th December, 2023.
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