Redox Part 1

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Info

Study Part

You can explain the expressions oxidation and reduction with help of their definitions

Definition The donation of an electron is called an **oxidation**

- $Cl_2 + 2e^- \rightarrow 2Cl^-$

Definition The uptake of an electron is called a **reduction**

- $Na \rightarrow Na^+ + e^-$

Rule A reduction can only take place, if at the same time an oxidation takes place.

- $2Na + Cl_2 \rightarrow 2Na^+ + 2Cl^-$

You can explain what happens during a redox reaction

During a redox reaction, the number of electrons is increased (oxidation) or decreased (reduction).

You are able to predict which redox reaction will take place and what products are formed

The reduced forms of the redox-pairs in the list in the upper part easily give away their electrons and thus can be found in nature in a reduced state. The oxidized forms of the redox-pairs in the list in the upper part easily give take up electrons and thus can be found in nature in an oxidized state.

Rule A reaction will be spontaneous, if the reduced form (on the left) of a possible reactant is higher in the list than the oxidized form (on the right) of the possible second reactant.

You are able to formulate correct equations for any redox reaction

1. Formulate the reactions for the oxidation and the reduction of the two reactants.
2. Multiply the two equations, in the way that the amount of electrons given away in the oxidation is the same as the amount of electrons taken up in the reduction.
3. Add the two equations.
4. Remove the electrons which will be found on both sides of the equation.

Example

1. $Al \rightarrow Al^{3+} + 3e^-$
   $S + 2e^- \rightarrow S^2$
2. $2Al \rightarrow 2Al^{3+} + 6e^-$
   $3S + 6e^- \rightarrow 3S^{2-}$
3. $2Al + 3s + 6e^- \rightarrow 2Al^{3+} + 3S^{2-} + 6e^-$
4. $2Al + 3S \rightarrow 2\mathrm{Al}^{3+} + 3\mathrm{S}^{2-}$

You can explain the expressions electrolysis and electrolyte

You understand how electric power can force reductions and oxidations that are otherwise impossible to take place

Definition Electrolysis is a reaction where elements are formed from compounds by the use of electric power.

Definition In electrolysis, anions are oxidized at the plus pole and cations are reduced at the minus pole.

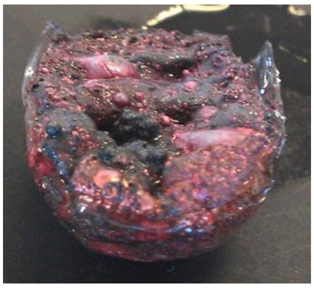
The electric power supply works as a pump for electrons. At the minus pole electrons are added in order to have a surplus of negative charge at the surface of the coal electrode. Therefore positively charged ions are attracted by the minus pole.
At the plus pole electrons are taken away from the power supply in order to give a surplus of positive charge at the surface of the coal electrons. Therefore negatively charged ions are attracted by the plus pole.

Electrolysis plays an important role in the production of many substances in industry, such as aluminum, chlorine, copper and sodium. In addition coating of metals with gold and silver is achieved by electrolysis in the galvanic industry.

Lab

Zinc powder and iodine

It can either be produced in a reaction of zinc powder and iodine crystals, adding water and heat it or the salt, which is formed (ZnI_2), can be put in an electrolysis and zinc resp. iodine are formed at the resp. poles.



Iron powder and copper oxide

Both reactants are mixed and heated, and a solid compound is formed$Fe + CuO \rightarrow FeO + Cu$.

Coal powder and copper oxide

Both reactants are mixed and heated (the formed gas is bubbled in to lime water, to prove CO_2) $2CuO + C \rightarrow CO_2 + 2Cu$. Interestingly enough, a **gas (molecule)** is formed in a redox reaction.