CHAPTER HIGHLIGHTS

Introduction to Electrochemistry

Vocabulary
electrochemistry
electrode
half-cell
anode
cathode

- Electrochemistry is the branch of chemistry that deals with electricity-related applications of redox reactions.
- The electrode immersed in an electrolyte solution is a half-cell.
- The anode is the electrode where oxidation takes place. The cathode is the electrode where reduction occurs.
- The cell consists of electrodes connected by a wire along which the electron travels and a salt bridge (or porous barrier) through which ions transfer to balance the charge.
- An electrochemical cell is a system of electrodes and electrolytes in which either chemical reactions produce electrical energy or electric current produces chemical change.

Voltaic Cells

Vocabulary
voltaic cell
reduction potential
electrode potential
standard electrode potential

- A voltaic cell, sometimes called a galvanic cell, uses a spontaneous redox reaction to produce electrical energy. Examples of voltaic cells are batteries and fuel cells.
- Fuel cells are voltaic cells in which the reactants are continuously supplied and the products are continuously removed.
- The potential difference must be measured across a complete cell because no transfer of electrons can occur unless both the anode and cathode are connected to form a complete circuit. Thus, the standard electrode potential for a half-cell is measured against the standard hydrogen electrode (SHE).
- Standard reduction potentials, E^0, are stated as reduction half-reactions. Effective oxidizing agents have positive E^0 values, while effective reducing agents have negative E^0 values.
- A voltaic cell has an E^0_{cell} value that is positive.
- Corrosion occurs when iron is exposed to oxygen and water. One of the best methods to prevent corrosion is by the use of sacrificial anodes.

Electrolytic Cells

Vocabulary
electrolytic cell
electroplating
electrolysis

- Electrolytic cells are cells in which electrical energy from an external source causes a nonspontaneous reaction to occur.
- An electrolytic cell has an E^0_{cell} value that is negative.
- Electrolysis has great economic impact. Applications of electrolytic cells are electroplating of metallic surfaces, rechargeable batteries, aluminum production, and purification of metals.