Cells and batteries notes



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An electrochemical cell typically consists of two electrodes (an anode and a cathode) and an electrolyte, which allows the movement of ions. The anode is where oxidation occurs, while reduction occurs at the cathode.

Galvanic cells (or voltaic cells) convert chemical energy into electrical energy spontaneously through redox reactions, while electrolytic cells require an external electrical source to drive non-spontaneous reactions.

Electrolytes are substances that dissociate into ions when dissolved in a solvent, allowing for the conduction of electricity through the solution. They are essential for facilitating the flow of ions between the anode and cathode in an electrochemical cell.

ELECTROCHEMISTRYElectrochemistry is the branch of the science that deals with the transformation of chemical energy into electrical energy and vice versa or it deals with the relationship between electrical and chemical energy produced in a redox reaction.

In the above reaction, Zn displaces copper ions (Cu2+) from aqueous solution. This reaction can be achieved very easily in practice. Put a Zn rod into a solution of CuSO4 (containing Cu2+ ions). It is observed that the blue color of CuSO4 solution disappears after some time. In this situation, Zn loses 2 electrons per atom, and Cu2+ ions in the solution accept them. Cu2+ ions from the solution in this manner are deposited in the form of solid Cu and Zn goes into the solution as Zn2+ (colorless). The reaction can well be understood in terms of two half-reactions:

Now, we can make the same reaction take place even if the copper ions and zinc rod are not in direct contact. If we put the Cu2+ ions and Zn rod in two separate containers and connect the two by a conducting metallic wire and introduce an inverted U shape instrument (called as salt-bridge), then electrons will still be transferred through the connecting wires. The electrons from the Zn rod travel to Cu2+ ions through the connecting wires and the same reaction takes place. This flow of electrons through the wire generates electricity.

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