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ELECTROCHEMICAL METHODS-CONCEPT, TYPES AND ELECTROCHEMICAL CELL

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ELECTROCHEMICAL CELL

- **It is a device capable of either generating electrical energy from chemical reactions or using electrical energy to cause chemical reactions.**
- **The electrochemical cells which generate an electric current are called voltaic cells or galvanic cells and those that generate chemical reactions, via electrolysis for example, are called electrolytic cells.**
- **A common example of a galvanic cell is a standard 1.5 volt cell meant for consumer use. A battery consists of one or more cells, connected in parallel, series or series-and-parallel pattern.**



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INTRODUCTION & CONCEPT

- **Electrochemistry is branch of chemistry concern with the interaction of electrical and chemical effects.**
- **A large part of this field deals with the study of chemical changes caused by the passage of an electrical current and the production of electrical energy by chemical reaction.**
- **It is named electrochemistry because its originated from the study of the movement of electrons in an oxidation–reduction reaction.**



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- **Electrochemical methods:** are analytical techniques that use a measurement of potential, charge, or current to determine an analyte's concentration or to characterize an analyte's chemical reactivity.
- It is a qualitative and quantitative methods of analysis based on electrochemical phenomena occurring within a medium or at the phase boundary and related to changes in the structure, chemical composition, or concentration of the compound being analyzed.
- These methods are divided into five major groups: potentiometry, voltammetry, coulometry, conductometry, and dielectrometry



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TYPE OF ELECTROCHEMICAL METHODS

- 1. Potentiometry methods:** it measures the potential of a solution between two electrodes. The potential is then related to the concentration of one or more analytes. The cell structure used is often referred to as an electrode even though it actually contains two electrodes: an indicator electrode and a reference electrode.
B. Potentiometry usually uses electrodes made selectively sensitive to the ion of interest, such as a fluoride-selective electrode. The most common potentiometric electrode is the glass-membrane electrode used in a pH meter.



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2. Voltammetry method:

It is based on the applies a constant and/or varying potential at an electrode's surface and measures the resulting current with a three electrode system. Voltammetry, with its variety of methods, constitutes the largest group of electrochemical methods of analysis and is commonly used for the determination of compounds in solutions (for example, polarography and amperometry



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3. COULOMETRY METHODS: based on the measurement of the amount of material deposited on an electrode in the course of an electrochemical reaction in accordance with Faraday's laws. A distinction is made between coulometry at constant potential and coulometry at constant current.

- Coulometry uses applied current or potential to completely convert an analyte from one oxidation state to another. In these experiments, the total current passed is measured directly or indirectly to determine the number of electrons passed.



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- **Knowing the number of electrons passed can indicate the concentration of the analyte or, when the concentration is known, the number of electrons transferred in the redox reaction.**

4. Conductometry methods:

- **in which the electrical conductivity of electrolytes (aqueous and non-aqueous solutions, colloid systems and solids) is measured.**
- **It is based on the change in the concentration of a compound or the chemical composition of a medium in the interelectrode space;**



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