Electrophoresis: Separating molecules by charged migration.

Mihkel Mazina*

Department of Chemistry and Biotechnology, School of Science, Tallinn University of Technology, Tallinn, 12618, Europe

Abstract

Electrophoresis is a technique used to separate and analyze molecules based on their size, charge, and shape. It is widely used in the fields of biochemistry, genetics, and proteomics to study DNA, RNA, proteins, and other biomolecules. The basic principle of electrophoresis is the movement of charged molecules in an electric field. When a sample is placed in a gel matrix and an electric current is applied, the molecules will move towards the electrode with the opposite charge. The movement of the molecules is influenced by factors such as their size, charge, and shape, allowing for their separation based on these properties.

Keywords: Gel Electrophoresis, Capillary electrophoresis, Genetic mutations.

Introduction

There are several types of electrophoresis, including gel electrophoresis, capillary electrophoresis, and two-dimensional electrophoresis. Gel electrophoresis is the most widely used technique and involves the separation of molecules in a gel matrix, such as agarose or polyacrylamide. Capillary electrophoresis is a high-resolution method that uses small capillaries to separate the molecules and can be performed with greater speed and accuracy than gel electrophoresis. Two-dimensional electrophoresis is a more advanced technique that allows for the separation and analysis of complex protein mixtures [1].

Electrophoresis has numerous applications in the fields of biochemistry, genetics, and proteomics. It is used to analyze DNA and RNA for genetic mutations, to study protein expression and interactions, and to purify and isolate specific molecules for further analysis. Gel Electrophoresis is a widely used method of electrophoresis used to separate DNA, RNA, and proteins based on size. In gel electrophoresis, the sample is placed in a gel matrix, such as agarose or polyacrylamide, and an electric current is applied, causing the molecules to move through the gel. The movement of the molecules is influenced by their size, with smaller molecules moving more quickly through the gel and larger molecules moving more slowly [2].

There are two main types of gel electrophoresis agarose gel electrophoresis and polyacrylamide gel electrophoresis. Agarose gel electrophoresis is used for the separation of large DNA and RNA molecules and is a simple, reliable, and cost-effective method. Polyacrylamide gel electrophoresis is used for the separation of proteins and is more complex, but provides higher resolution and sensitivity compared to agarose gel electrophoresis. Gel Electrophoresis is the most widely used method of electrophoresis and is used to separate DNA, RNA, and proteins based on size. The sample is placed in a gel matrix, such as agarose or polyacrylamide, and an electric current is applied, causing the molecules to move through the gel. The smaller molecules move more quickly through the gel, resulting in a separation based on size [3].

Capillary Electrophoresis is a high-resolution method that uses small capillaries to separate the molecules and can be performed with greater speed and accuracy than gel electrophoresis. Capillary electrophoresis is particularly useful for the analysis of small molecules, such as amino acids and nucleotides. Two-Dimensional Electrophoresis: This method is used to separate complex protein mixtures. The first dimension separates the proteins based on size and the second dimension separates the proteins based on charge. This method is particularly useful for the analysis of proteomes, the entire set of proteins produced by a organism. SDS-PAGE (Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis): This method is used to separate proteins based on size and charge. The proteins are treated with SDS, a detergent that coats the protein and gives it a negative charge, allowing for separation based on size and charge [4].

IEF (Isoelectric Focusing) method is used to separate proteins based on their isoelectric point, the pH at which a protein has no net charge. The proteins are separated based on their charge in a pH gradient, resulting in a separation based on their isoelectric point. These are some of the most commonly used electrophoresis methods and each method has its own advantages and limitations. The choice of method depends on the type of molecule being analyzed and the goals of the experiment. Regardless of the method chosen, electrophoresis is a powerful tool for the separation and analysis of biomolecules [5].

***Correspondence to:** Mihkel Mazina, Department of Chemistry and Biotechnology, School of Science, Tallinn University of Technology, Tallinn, Europe, E-mail: mihkel@chemnet.re

***Received:** 24-Jan-2023, Manuscript No. AAACBC-22-88302; **Editor assigned:** 25-Jan-2023, PreQC No. AAACBC-22-88302(PQ); **Reviewed:** 08-Feb-2023, QC No. AAACBC-22-88302; **Revised:** 13-Jan-2023, Manuscript No. AAACBC-22-88302(R); **Published:** 20-Feb-2023, DOI:10.35841/aacbc-7.1.131*

***Citation:** Mazina M. Electrophoresis: Separating molecules by charged migration. J Clin Bioanal Chem. 2023;7(1):131*

Conclusion

In conclusion, electrophoresis is a powerful tool for the separation and analysis of molecules based on their size, charge, and shape. Its wide range of applications and versatility make it an essential tool in the study of biomolecules and their role in health and disease.

References

1. Wang X, Li K, Yao L, et al. Recent advances in vitamins analysis by capillary electrophoresis. J Pharm Biomed Anal. 2018;147:278-87.
2. Cheng M, Chen Z. Recent advances in screening of enzymes inhibitors based on capillary electrophoresis. J pharma anal. 2018;8(4):226-33.
3. Kaczmarczyk N, Ciżewska J, Treder N, et al. The critical evaluation of the effects of imidazolium-based ionic liquids on the separation efficiency of selected biogenic amines and their metabolites during MEKC analysis. Talanta. 2022;238:122997.
4. Calabuig HS, Peris-García E, Garcia-Alvarez-Coque MC, et al. Suitability of 1-hexyl-3-methylimidazolium ionic liquids for the analysis of pharmaceutical formulations containing tricyclic antidepressants. J Chromatogr. 2018, 1559, 118-127.
5. Flieger J, Flieger M. Ionic liquids toxicity-benefits and threats. Int J Mol Sci. 2020;21(17):6267.

Citation: *Mazina M. Electrophoresis: Separating molecules by charged migration. J Clin Bioanal Chem. 2023;7(1):131*